(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号
特開2000－58492
（Ｐ２０００－５８４９２Ａ）
(43)公開日　平成12年２月25日(2000.2.25)

(51)Int.Cl.[7]	識別記号	ＦＩ			ﾃｰﾏｺｰﾄﾞ (参考)
H01L 21/304	642	H01L 21/304	642	A	
	648		648	K	

審査請求　有　請求項の数３　ＯＬ　（全18頁）

(21)出願番号　特願平11－233723
(62)分割の表示　特願平6－145939の分割
(22)出願日　平成６年６月28日(1994.6.28)
(31)優先権主張番号　特願平5－215129
(32)優先日　平成５年８月６日(1993.8.6)
(33)優先権主張国　日本（ＪＰ）

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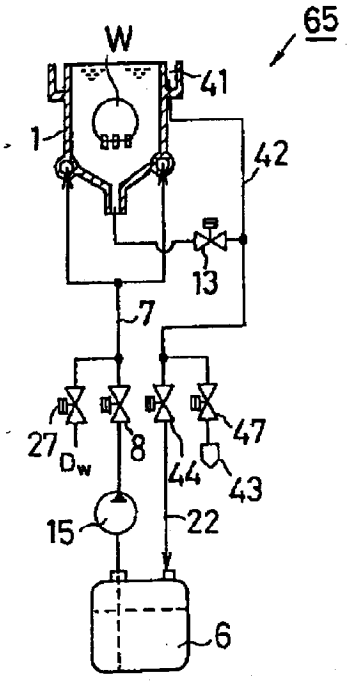
(54)【発明の名称】基板の浸漬処理装置

(57)【要約】
【目的】　半導体基板などの表面処理を行う基板処理装置が大型化するのを防止しつつ浸漬処理装置の処理液の消費量を抑えてランニングコストを低減する。
【構成】　オーバーフロー型の基板処理槽１から導出した排液路４２を分岐して、一方を排液弁４７を介してドレン４３に、他方を処理液回収路２１として処理液回収弁４４を介して処理液貯留容器６に接続する。複数種の表面処理毎に、基板処理槽１からオーバーフローした処理液を処理液回収弁４４を介して貯留容器６に回収して再利用する。薬液処理から純水処理への移行に際して、基板処理槽内に処理液が入った状態で純水を供給し、オーバーフローさせて処理液を純水に置き換え、基板を空気に触れさせないで、基板の表面に酸化皮膜が形成されるのを防止する。



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【特許請求の範囲】

【請求項１】　処理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して成る基板の浸漬処理装置において、

上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、

薬液処理では、処理液貯留容器内の処理液を処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、

上記薬液処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廃棄し、

上記薬液処理から純水処理への移行に際しては、処理液の供給を停止し、続いて、上記基板処理槽に処理液を入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内の処理液を純水に置き換える、ことを特徴とする基板の浸漬処理装置。

【請求項２】　処理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して成る基板の浸漬処理装置において、

上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、

ＨＦ処理では、処理液貯留容器内のＨＦを処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、

上記ＨＦ処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廃棄し、

上記ＨＦ処理から純水処理への移行に際しては、ＨＦの供給を停止し、続いて、上記基板処理槽にＨＦ入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内のＨＦを純水に置き換える、ことを特徴とする基板の浸漬処理装置。

【請求項３】　請求項１又は請求項２に記載の基板の浸漬処理装置において、

前記処理液供給路の圧送ポンプと前記処理液導入弁との

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間にフィルタを付設するとともに、処理液導入弁よりも下流側に純水供給路を連通し、

上記処理液供給路の圧送ポンプと純水供給路接続部との間に処理液回収路を接続し、

純水処理では、圧送ポンプで汲み上げた処理液を処理液回収路に流通させて上記処理液貯留容器に還流させる、ことを特徴とする基板の浸漬処理装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、基板処理装置の浸漬処理部において半導体ウエハや液晶用ガラス基板等の薄板状の基板（以下単に基板と称する）を表面処理するのに用いられる基板の浸漬処理装置に関する。

【０００２】

【従来の技術】上記基板処理装置としては、従来より例えば図１９に示すものがあり、その浸漬処理部１６５において用いられる基板の浸漬処理装置としては、図２０に示すもの（以下従来例１という）、あるいは、特開平４－４２５３１号公報に開示されたもので、図２１に示すもの（以下従来例２という）が知られている。ここで図１９は基板処理装置全体の平面図である。

【０００３】この基板処理装置１５０は、図１９に示すように、基板Ｗを収容したカセットＣの搬入部１５１と、カセットＣから基板Ｗを取り出す基板取出部１６０と、複数の基板Ｗを一括保持して搬送する基板搬送ロボット１７５と、基板搬送ロボット１７５のチャックハンドを洗浄するチャック洗浄部１６３と、当該ロボット１７５で保持した複数の基板Ｗを浸漬して順次処理する複数の浸漬処理部１６５と、浸漬処理部１６５の後側に配置された乾燥部１７０と、カセットＣ内へ処理済みの基板Ｗを収納する基板収納部１８０と、基板Ｗを収納したカセットＣを搬出する搬出部１５２とから構成されている。

【０００４】そして上記浸漬処理部１６５には、例えば図２０(A)(B)に示すような浸漬処理装置が配置され、各種の表面処理をなすように構成されている。図２０(A)は基板Ｗを複数種の処理液による表面処理（以下薬液処理という）をするための基板の浸漬処理装置であり、図２０(B)は当該基板Ｗを純水D_Iによるリンス処理（以下純水処理という）をするための浸漬処理装置である。これらの浸漬処理装置は、上記浸漬処理部１６５（１６５ａ～１６５ｆ）のいずれかに適宜配置される。

【０００５】図２０(A)の浸漬処理装置は、処理液中に基板Ｗを浸漬して表面処理をするオーバーフロー型の基板処理槽１０１ａと、基板処理槽１０１ａに連結した処理液供給路１０７と、処理液供給路１０７に処理液導入弁１０８、フィルタ１１０、及び圧送ポンプ１１５を順に介して連通した処理液貯留容器１０６と、基板処理槽１０１ａよりオーバーフローした処理液を処理液貯留容器１０６に回収する回収路１４２ａと、処理液供給路１

０７と回収路１４２ａとを開閉可能に連通する給排切換弁１１３ａとを具備して成り、薬液処理に際して基板処理槽１０１ａからオーバーフローした処理液を処理液貯留容器６に還流させるように構成されている。

【０００６】また、図２０(B)の浸漬処理装置は、オーバーフロー型の基板洗浄槽１０１ｂと、基板洗浄槽１０１ｂに連結した純水供給路１０３と、純水供給路１０３に設けた純水導入弁１２７と、基板洗浄槽１０１ｂよりオーバーフローした純水を排水ドレン１４３に導出する排水路１４２ｂと、純水供給路１０３と排水路１４２ｂとを開閉可能に連通する給排切換弁１１３ｂとを具備して成り、純水処理に際して基板洗浄槽１０１ｂからオーバーフローした排水をドレン１４３に排出するように構成されている。

【０００７】一方、従来例２は図２１に示すように、単一の基板処理槽１０１内に複数種の処理液１０２を順次供給して基板Wの表面処理を行うようにしたものである。即ち、処理液１０２中に複数の基板Wを浸漬して基板Wの表面処理をなすオーバーフロー型の基板処理槽１０１と、基板処理槽１０１の下部より複数種の処理液１０２を供給する処理液供給路１０３と、処理液供給路１０３にそれぞれ処理液導入弁108_a～108_c及び流量調節器107_a～107_cを介して連通した複数個の処理液貯留容器106_a～106_cと、純水導入弁108_b及び流量調節器107_bを介して連通した純水供給源106_bを備え、各導入弁108_a～108_bを選択的に開閉制御して所定の処理液Q_a～Q_cを基板処理槽１０１へ供給するように構成されている。

【０００８】上記処理液貯留容器106_a～106_cのうち、例えば処理液貯留容器106_aには過酸化水素Q_a、106_bには塩酸Q_b、106_cにはフッ化水素のようなエッチング剤Q_cなどが貯溜されている。そして、基板処理槽１０１はこれら複数種の表面処理毎に処理液１０２の置換が可能なオーバーフロー型の処理槽として構成され、オーバーフローした処理液はドレン(図示省略)へ排出される。

【０００９】

【発明が解決しようとする課題】上記基板処理装置１５０は、各浸漬処理部１６５ａ～１６５ｆのそれぞれに図２０（A）（B）の浸漬処理装置が配置されることから、装置全体が大型化するという難点がある。また、従来例２は複数の処理液による薬液処理ごとに、基板処理槽１０１からオーバーフローした処理液をドレンに廃棄するので、処理液の消費量が多くなり、基板処理装置全体のランニングコストは高価になる。本発明は、このような事情に鑑みてなされたもので、基板処理装置が大型化するのを防止し、併せてランニングコストの低減を図ることを技術的課題とする。

【００１０】

【課題を解決するための手段】請求項１に記載の発明

は、前記課題を解決するために以下の構成を備える。即ち、処理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して成る基板の浸漬処理装置において、上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、薬液処理では、処理液貯留容器内の処理液を処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、上記薬液処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廃棄し、上記薬液処理から純水処理への移行に際しては、処理液の供給を停止し、続いて、上記基板処理槽に処理液を入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内の処理液を純水に置き換える、ことを特徴とするものである。

【００１１】また、請求項２に記載の発明は、処理液中に基板を浸漬して基板の表面処理をなすオーバーフロー型の基板処理槽と、上記基板処理槽に連結した処理液供給路と、上記処理液供給路に処理液導入弁及び圧送ポンプを順に介して連通した処理液貯留容器と、上記処理液供給路に純水導入弁を介して連通した純水供給路と、上記基板処理槽よりオーバーフローした排液を排液ドレンに導出する排液路とを具備して成る基板の浸漬処理装置において、上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、ＨＦ処理では、処理液貯留容器内のＨＦを処理液供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収し、上記ＨＦ処理の後で行われる純水処理では、純水を純水供給路から基板処理槽に供給してオーバーフローさせ、上記排液路から排液弁を介して排液ドレンに廃棄し、上記ＨＦ処理から純水処理への移行に際しては、ＨＦの供給を停止し、続いて、上記基板処理槽にＨＦ入れた状態で純水を供給してオーバーフローさせることにより、上記基板処理槽内のＨＦを純水に置き換える、ことを特徴とするものである。

【００１２】そして請求項３の発明は、請求項１又は請求項２に記載の基板の浸漬処理装置において、前記処理液供給路の圧送ポンプと前記処理液導入弁との間にフィルタを付設するとともに、処理液導入弁よりも下流側に純水供給路を連通し、上記処理液供給路の圧送ポンプと純水供給路接続部との間に処理液回収路を接続し、純水

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処理では、圧送ポンプで汲み上げた処理液を処理液回収路に流通させて上記処理液貯留容器に還流させる、ことを特徴とするものである。

【００１３】

【作用】請求項１の発明では、基板処理槽への処理液供給路に純水導入弁を介して純水供給路を連通したことから、一つの基板処理槽により薬液処理と純水処理とが順次実行されることになる。また、上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、薬液処理では、処理液貯留容器内の処理液が処理液供給路から基板処理槽に供給されてオーバーフローし、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収され、再び基板処理槽に還流する。つまり、処理液は廃棄されずに再利用される。他方、上記薬液処理の後で行われる純水処理では、純水は純水供給路から基板処理槽に供給されてオーバーフローし、上記排液路から排液弁を介して排液ドレンに廃棄される。そして上記薬液処理から純水処理への移行に際しては、処理液の供給が停止され、引き続き、上記基板処理槽に処理液を入れた状態で純水が供給されてオーバーフローすることにより、上記基板処理槽内の処理液が純水に置き換えられる。つまり、基板処理槽内では、基板は空気に触れることなく、薬液処理から純水処理へ移行する。

【００１４】請求項２の発明においても、基板処理槽への処理液供給路に純水導入弁を介して純水供給路を連通したことから、一つの基板処理槽により薬液処理と純水処理とが順次実行される。また、上記排液路を分岐して一方は排液弁を介して排液ドレンに連通するとともに、他方は処理液回収路として処理液回収弁を介して上記処理液貯留容器に連通し、ＨＦ処理では、処理液貯留容器内のＨＦが処理液供給路から基板処理槽に供給されてオーバーフローし、上記排液路から処理液回収弁を介して当該処理液貯留容器に回収され、ＨＦは廃棄されずに再利用される。他方、上記ＨＦ処理の後で行われる純水処理では、純水が純水供給路から基板処理槽に供給されてオーバーフローし、上記排液路から排液弁を介して排液ドレンに廃棄される。そして上記ＨＦ処理から純水処理への移行に際しては、ＨＦの供給が停止され、引き続き、上記基板処理槽にＨＦ入れた状態で純水が供給それてオーバーフローすることにより、上記基板処理槽内のＨＦが純水に置き換えられる。つまり、基板処理槽内では、基板は空気に触れることなく、ＨＦ処理から純水処理へ移行する。

【００１５】請求項３の発明では、請求項１又は請求項２に記載の基板の浸漬処理装置において、前記処理液供給路の圧送ポンプと前記処理液導入弁との間にフィルタを付設するとともに、処理液導入弁よりも下流側に純水供給路を連通し、上記処理液供給路の圧送ポンプと純水

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供給路接続部との間に処理液回収路を接続したことから、薬液処理（ＨＦ処理を含む。以下同様）及び純水処理が行われている間に、処理液（ＨＦを含む。以下同様）はフィルタリングによりリフレッシュされる（以下単に「フィルタリング」という）。また、純水処理が行われる場合においても、圧送ポンプで汲み上げられた処理液は、フィルタリングされてから処理液回収路を流下し、再び処理液貯留容器に還流する。

【００１６】

【発明の実施の形態】以下、本発明の実施の形態を図面に基づいて説明する。先ず本発明が適用される基板洗浄用の基板処理装置について説明する。図１６は基板処理装置の概略斜視図、図１７は同装置の概略平面図、図１８は同装置の概略縦断面図である。本基板処理装置５０は、後述する浸漬処理部６５において複数の基板処理槽１を並設して半導体ウエハ（以下単にウエハという）の洗浄処理を行うとともに、基板処理槽１からオーバーフローした洗浄液（以下単に処理液という）を処理液貯留容器６に回収してリサイクル可能にしたものである。

【００１７】図１６～図１８に示すように、この基板処理装置５０は、基板収容カセットＣの搬入搬出部５１と、カセットＣからウエハＷを取り出し又はカセットＣ内へウエハＷを装填する基板移載部６０と、カセットＣの搬入搬出部５１と基板移載部６０との間でカセットＣを移載するカセット移載ロボット５５と、複数のウエハＷを一括して洗浄する浸漬処理部６５と、ウエハＷの液切り基板乾燥部７０と、基板移載部６０でカセットＣから取り出した複数のウエハＷを一括保持して上記浸漬処理部６５及び基板乾燥部７０に搬送する基板搬送ロボット７５とから構成される。

【００１８】上記カセット移載ロボット５５は、図１６～図１８に示すように、昇降及び回転自在で、矢印Ａ方向に移動可能に構成され、搬入搬出部５１に搬入されてきたカセットＣを基板移載部６０のテーブル６１上に移載し、また、洗浄済みウエハＷを収容したカセットＣを当該テーブル６１から搬入搬出部５１へ移載するように構成される。また、上記基板搬送ロボット７５は、図１６～図１８に示すように、矢印Ｂ方向に移動可能に設けられ、上記基板移載部６０のリフター６４から受け取った複数のウエハＷを基板搬送ロボット７５の基板挟持アーム７６で保持し、移動部７７に沿って浸漬処理部６５内及び基板乾燥部７０内へ順次搬送するように構成される。

【００１９】上記浸漬処理部６５には、以下に述べるように、本発明に係る各種の浸漬処理装置が配設される。ただし、図１６～図１８においては、基板処理槽１を３個並設したものが例示してある。即ち、上記浸漬処理部６５は、オーバーフロー型の基板処理槽１を３個並設して成り、各基板処理槽１に昇降可能に設けた基板保持具６６により、前記基板搬送ロボット７５から受け取った

複数のウエハWを各基板処理槽１内に順次浸漬可能に構成される。なお、本発明の実施形態に係る浸漬処理装置の具体的な内容については後述する。

【００２０】上記基板乾燥部７０は、例えば本出願人の提案に係る特開平１－２５５２２７号公報に開示したように、ウエハWの主平面の中心近傍を回転中心として、回転遠心力で液切り乾燥する乾燥処理槽７１を具備して成る。なお、この基板乾燥部７０は、当該遠心式のものに替えて、有機溶剤等を使用した乾燥方式、又はこれに加えて加熱蒸気や減圧による乾燥方式により乾燥を促進するようにしても差し支えない。

【００２１】上記基板処理装置５０のレイアウトとしては、図１６～図１８に示すように、クリーンルーム作業域３０に臨む前方から保全用作業域３１に臨む後方に向かって前記カセットCの搬入搬出部５１、基板移載部６０、基板乾燥部７０及び浸漬処理部６５を順番に配置する。また、図１６及び図１８に示すように、上記浸漬処理部６５の３つの基板処理槽１の下部に処理液の給排用配管室２０を、また、この給排用配管室２０の下部に洗浄用の処理液貯留容器６を上下３段に配置する。さらに、図１６及び図１７に示すように、上記基板移載部６０・基板乾燥部７０・浸漬処理部６５の右側に基板搬送ロボット７５の移動部７７を前後方向に形成し、これらの左側の空間で、前記基板移載部６０よりも後方の空間をメンテナンス・スペース９０として形成する。尚、メンテナンス・スペース９０の床部には複数の配管、バルブ等が敷設される。

【００２２】即ち、上記基板処理装置５０では、浸漬処理部６５の基板処理槽１と、給排用配管室２０と、処理液貯留容器６とを上下３段に積み上げ、縦方向にレイアウトするので、これらの積み上げ部の左側に臨んだエリアにメンテナンス・スペース９０を確保できる。換言すると、図１７に示すように、浸漬処理部６５や基板移載部６０などの各種作業ブロックを平面視でL字状にまとめることにより、基板処理装置５０内の余剰空間をメンテナンス・スペース９０として設定できる。また、主に浸漬処理部６５を縦向きに積み上げることにより、基板処理装置５０全体をコンパクトにまとめてクリーンルーム全体の省スペース化を効率良く図れるうえ、当該基板処理装置５０の設置数が増えるほど、クリーンルームにおけるスペースの有効利用率を一層高められる。

【００２３】また、上記浸漬処理部６５の基板処理槽１及び基板乾燥部７０のレイアウトでは、図１６～図１８に示すように、保全用作業域３１に臨む奥側からクリーンルーム作業域３０に臨む前側に向かって、３つのオーバーフロー型の基板処理槽１と、乾燥処理部７０と前記基板移載部６０とを順番に配列する。即ち、上記基板乾燥部７０は浸漬処理部６５と基板移載部６０の間に配置されるので、洗浄処理されたウエハWを可能な限り速く乾燥させ、カセットCに戻して搬入搬出部５１から効率良く搬出できる。その反面、この基板乾燥工程はカセットCへの戻しに対する時間的制約を強くは受けず、乾燥処理の完了から基板移載部６０への戻しの間に待機時間を取れるので、作業工程の面で隣接状の基板移載部６０に対して乾燥処理部７０にバッファ的な役割を担わせることができる。

【００２４】また、通常、酸洗浄処理においては昇温した酸を使用するので、酸の蒸気やミストが発生し易いが、例えば、クリーンルーム作業域３０から最も遠い奥側の基板処理槽１でこの酸洗浄処理を実施する場合には、クリーンルーム作業域３０への悪影響を防止して作業の安全性を確保できる。以下、上記浸漬処理部６５に配設される各種浸漬処理装置の実施形態について順次説明する。

【００２５】図１は本発明の実施形態１に係る浸漬処理装置の概略系統図である。この浸漬処理装置は、図１に示すように、処理液中に複数の基板Wを一括して浸漬して基板Wの表面洗浄をなす３つの基板処理槽１・１・１と、各基板処理槽１の下部より処理液を供給する処理液供給路７と、処理液供給路７に処理液導入弁８及び圧送ポンプ１５を順に介して連通した処理液貯留容器６と、処理液供給路７に純水導入弁２７を介して連通した純水供給路３と、基板処理槽１よりオーバーフローした排液を排液ドレン４３に導出する排液路４２とを具備して成る。即ち、各基板処理槽１では夫々所定の処理液Q_1～Q_6により後述する薬液処理が別々に行われる。

【００２６】上記基板処理槽１は、図１に示すように、石英ガラス製で側面視略V字状・平面視略矩形状に形成され、その下部に処理液供給路７を連結して成り、基板処理槽１内に処理液の均一な上昇流を形成して基板Wを表面処理するとともに、処理液を複数種の洗浄処理毎に、迅速に置換し得るオーバーフロー槽として構成される。当該基板処理槽１は石英ガラス製に限らず、例えば、石英ガラスを腐食させてしまうHF等を洗浄液に用いる場合には、耐食性を有する四フッ化エチレン樹脂等の樹脂製材料で形成したものでも良い。また、浸漬処理部６５には４つ以上のオーバーフロー型基板処理槽１を並設しても差し支えない。

【００２７】処理液を供給するための構成は、図１に示すように、各基板処理槽１の下部に並列状に連結した処理液供給路７と、処理液供給路７に処理液導入弁８及び圧送ポンプ１５を介して連結した処理液貯留容器６と、上記処理液供給路７に純水導入弁２７を介して連通した純水供給路３及び純水供給源（図示省略）とを具備して成る。なお、上記純水供給路３は常温の又は所定温度に加熱した純水D_Wを供給する純水の主要通路となるが、純水D_Wは基板の表面酸化を防ぐうえで、脱酸素処理を施したものを用いるのが好ましい。

【００２８】上記処理液導入弁８を開弁すると、処理液貯留容器６内の処理液が圧送ポンプ１５で基板処理槽１

に圧送され、基板処理槽１よりオーバーフローされ、薬液処理が行われる。また、上記純水導入弁２７を開弁すると、純水D_Wが純水供給路３から基板処理槽１に供給され、オーバーフローして純水処理が行われる。即ち、処理液導入弁８と純水導入弁２７との切り換え操作で処理液Q_A～Q_Cと純水D_Wを処理液供給路７に選択的に供給可能に構成される。なお、上記処理液貯留容器６には、処理液Q_A～Q_Cが自動的に補充可能に構成されている。

【００２９】処理液Q_A～Q_Cを排出するための構成は、図１に示すように、各基板処理槽１の上側部に付設したオーバーフロー液回収部４１と、オーバーフローした処理液を排出する排液路４２と、基板処理槽１の底部から当該排液路４２に給排切換弁１３を介して導出した連通路４とを具備して成る。上記排液路４２の流通下手側を二股状に分岐して、その一方を排液弁４７を介して排液ドレン４３に接続し、その他方を処理液回収路２２として処理液回収弁４４を介して前記処理液貯留容器６に接続する。なお、上記給排切換弁１３は、必要に応じて基板処理槽１内の各処理液Q_A～Q_Cを排液路４２へ導出するためのものである。

【００３０】本実施形態１では、図１に示すように、各基板処理槽１の下部には、各処理液貯留容器６から導出した処理液供給路７が処理液導入弁８を介して接続されており、所定の処理液Q_A～Q_Cが各処理液貯留容器６から各基板処理槽１に夫々供給される。また、各基板処理槽１の下部には純水供給路３が純水導入弁２７を介して接続されており、純水D_Wが各基板処理槽１に夫々供給可能になっている。そして、基板処理槽１の上部から導出した排液路４２の下流側は、処理液回収弁４４を介して連通された処理液貯留容器６の側と、排液弁４７を介して連通された排液ドレン４３の側との２方向に分岐されている。このため、図１の処理液Q_Aについて述べると、処理液貯留容器６内の処理液Q_Aは、処理液供給路７から各基板処理槽１にオーバーフローしてウエハWを洗浄した後、排液路４２から処理液回収弁４４を介して処理液貯留容器６に回収され、基板処理槽１にリサイクルされる。

【００３１】一方、薬液処理の後で行われる純水処理では、純水D_Wが純水供給路３から基板処理槽１に供給されてオーバーフローされ、排液路４２から排液弁４７を介して排液ドレン４３に廃棄される。なお、処理液Q_B及びQ_Cについても同様に基板処理槽１から回収可能に構成される。従って、基板処理槽１からオーバーフローした各処理液Q_A～Q_Cは処理液回収弁４４を介して処理液貯留容器６に回収されて再利用されるので、複数種の薬液処理毎に処理液を廃棄する従来例２に比べて処理液の消費量を効果的に抑制して、基板処理装置全体のランニングコストを低減できる。

【００３２】また、この浸漬処理装置では、図１に示すように、並設した３つの基板処理槽１にウエハWを順次浸漬して複数種の処理液Q_A～Q_Cで並行処理するのでスループットが向上する。しかも、この浸漬処理装置では処理液を基板処理槽１の上部からオーバーフローさせるので、薬液処理から純水処理に移行する際には、基板処理槽１内の洗浄液を全部排出せずとも薬液を純水に置換することが可能であり、薬液処理及び純水処理が完了するまでウエハWは空気に触れない。このため、ウエハ表面に酸化皮膜が形成されたり、空気中の不純物が付着したりする虞れはない。また、基板処理槽１内の洗浄液を全部排出せずともウエハWの装填や取り出しができる。

【００３３】次に上記実施形態１における薬液処理の内容について一例を挙げて説明する。第１番目の基板処理槽１ではＳＣ１処理を行う。処理液Q_Aとしては調製したアンモニア（NH_4OH）と過酸化水素水（H_2O_2）と純水D_Wとの混合液を使用する。処理液Q_Aによる薬液処理の後で純水処理を実施し、ウエハWの表面に付着したフォトレジスト等の有機物を除去する。なお、ＳＣ１処理に代えてＣＡＲＯ処理を行う場合もある。この場合の処理液Q_Aとしては硫酸過水を用いる。

【００３４】また、第２番目の基板処理槽１ではＳＣ２処理を行う。処理液Q_Bとしては調製した塩酸（ＨＣｌ）と過酸化水素水（H_2O_2）と純水の混合液を使用する。同様に処理液Q_Bによる薬液処理の後で純水処理を実施し、ウエハWの表面に付着した金属イオンを除去する。さらに、第３番目の基板処理槽１ではＨＦ処理を行う。処理液Q_Cとしてはフッ化水素の５０％水溶液を使用し、ウエハWの表面の未露光部分等をエッチングする。なお、上記フッ化水素に代えてリン酸過水を用いる場合もある。

【００３５】ウエハの洗浄処理をふくむ表面処理は、その製造工程により一様ではなく、第１番目～第３番目の基板処理槽１に順次浸漬するとは限らない。ちなみに、その類型として例えば下記（１）～（４）のような種々の表面処理が可能である。

（１）ＳＣ１処理→ＨＦ処理→ＳＣ２処理

（２）ＨＦ処理→ＳＣ１処理→ＳＣ２処理

（３）ＳＣ１処理→ＳＣ２処理

（４）その他、ＨＦ処理のみ、又はＳＣ１処理のみ。

上記薬液処理の類型は、後述する実施形態においても同様に適用できるものであり、重複する説明は省略する。

【００３６】なお、いずれかの薬液処理においてＨＦ処理が含まれる場合には、ＨＦ処理した後にウエハWを空気に接触させると、ＨＦ、O_2とＳｉとが反応し、ウエハWの表面に不純化合物が生じてパーティクルとなる。このため、ＨＦを基板処理槽１に供給して循環した後、ＨＦの供給を停止し、続いて、基板処理槽１にＨＦを入れた状態で純水を供給し、オーバーフローさせることによりＨＦを純水に置き換えていく。これにより、ウエハWは常に液中にとどまり、純水の連続供給によりＨＦ成

分はパーティクルを発生することなく除去される。

【００３７】上記純水による最終リンス処理では、純水の比抵抗値を検出したり、一定時間の経過により、純水処理が完了するように構成される。また、最終リンスが完了した後に基板処理槽１からウエハWを引き上げる場合には、浮遊したパーティクルがウエハWに付着するのを防止するため、純水をオーバーフローさせながら行う。

【００３８】なお、上記実施形態１における利点として、単一の基板処理槽１を用いて薬液処理と純水処理とを実施することにより基板処理槽１の個数を減らして基板処理装置の大型化を防止できる点、各処理液Q_A～Q_Cを処理液貯留容器６に回収して再利用することによりランニングコストを低減できる点、薬液処理から純水処理に移行する際に基板処理槽１内の処理液を全部排出しないで処理液を純水に置換することによりウエハ表面に酸化皮膜が形成されるのを防止できる点が挙げられるが、これらの利点は、後述する実施形態２～実施形態１１においても同様であり、重複する説明は省略する。

【００３９】図２は本発明の実施形態２に係る浸漬処理装置の概略系統図である。この浸漬処理装置は、図２に示すように、前記浸漬処理部６５に配設される３つの基板処理槽１のうちの１槽を、純水処理専用の基板処理槽に設定したものである。即ち、リンス専用槽１の下部から純水供給路３を導出し、純水供給路３に純水導入弁２７を介して純水供給源（図示せず）を接続するとともに、リンス専用槽１の上部から排液路４２を導出し、排液路４２に排液弁４７を介して排液ドレン４３を接続して、純水D_Wがリンス専用槽１に供給され、オーバーフローしてウエハWを純水処理するとともに、排液路４２から排液弁４７を介して排液ドレン４３に廃棄されるように構成されている。

【００４０】本実施形態２では、２個の基板洗浄槽１の夫々で処理液Q_A又はQ_Bによる薬液処理が施された後、引き続いて軽く純水処理が行なわれるが、さらに別途に上記リンス専用槽１で純水D_Wによる純水処理が行われる。このため、実施形態１のように各基板処理槽１で薬液処理と純水処理とを行う場合に比べて、強力にウエハWをリンスでき、純水処理の所要時間が短縮されてスループットが向上する。

【００４１】図３は本発明の実施形態３に係る浸漬処理装置の概略系統図である。この浸漬処理装置は、基板洗浄装置５０の浸漬処理部６５に単槽の基板処理槽１を配設したもので、前記実施形態１又は実施形態２と同様に、基板処理槽１に供給されてオーバーフローする処理液を処理液回収路２２と処理液回収弁４４を介して処理液貯留容器６に回収して再利用可能に構成するとともに、基板処理槽１よりオーバーフローした純水D_Wを排液ドレン４３に廃棄するように構成する。　この実施形態３においても、処理液の消費量を抑制するとともに、基板処理槽１の単槽化で基板処理装置５０全体をコンパクトにまとめられる。

【００４２】図４は本発明の実施形態４に係る浸漬処理装置の概略系統図である。この実施形態４は、複数の処理液貯留容器６を切り換え可能に接続したものである。この浸漬処理装置は、処理液を基板処理槽１から処理液貯留容器６に循環させて再利用可能にした点は前記実施形態１～３と同様であるが、前記実施形態１が３つの基板処理槽１で３種類の薬液処理を別々に行うのに対して、本実施形態４は１つの基板処理槽１内で３種類の薬液処理を順番に行うようにして、複数種の薬液処理に対して基板処理槽１を共用化した点に特徴がある。

【００４３】即ち、図４(A)に示すように、３種類の処理液Q_A・Q_B・Q_Cの各処理液貯留容器６から各処理液導入弁8_A・8_B・8_Cを介して処理液供給路７を１個の基板処理槽１の下部に連結する。ここで、上記処理液導入弁8_A・8_B・8_Cは、処理液選択弁８２でもある。また、図４(B)はこの処理液の供給側において、各処理液を供・断する処理液導入弁8_A・8_B・8_C及び純水導入弁２７が集合した導入弁連結路１６を示し、当該連結路１６の一端１６ａには純水供給路３が接続され、その他端１６ｂには処理液供給路７が接続される。

【００４４】上記基板処理槽１の排液路４２の下流側を夫々４本に分岐し、これらの一方を排液ドレン４３に対して接続し、他方を処理液回収路２２（具体的には２２ａ・２２ｂ・２２ｃ）として上記３種類の処理液Q_A・Q_B・Q_Cの処理液貯留容器６に対して接続する。オーバーフローした各種の処理液を処理液貯留容器６に回収するとともに、必要に応じて排液ドレン４３に廃棄できるように構成する。図４（C）はこの処理液の排出側において、各処理液を供・断する処理液回収弁44_A・44_B・44_C及び排液弁４７の集合した排液路４２の要部を示し、排液路４２の下流側の最奥部４２ａには純水用の上記排液弁４７が設けられる。ここで、上記処理液回収弁44_A・44_B・44_Cは、処理液戻選択弁８３でもある。

【００４５】一方、上記基板処理槽１への各処理液Q_A～Q_Cの圧送手段２５は、図４(A)に示すように、各処理液貯留容器６(具体的には6_A～6_C)から導出した処理液供給路７(具体的には7_A～7_C)に設けた１個の圧送ポンプ１５と、圧送ポンプ１５を駆動するモータ１９と、圧送ポンプ１５の吐出側に設けた圧力検出器２６(具体的には、圧力計)と、圧力検出器２６からの検出信号に基づいて圧送ポンプ１５の回転数を増減制御する制御手段１２とから構成される。当該圧送手段２５では、設定圧に対する過不足を圧力検出器２６で検出し、当該制御手段１２が圧送ポンプ１５の駆動モータ１９を駆動制御して、基板処理槽１に所定の設定圧力で処理液が圧送される。

【００４６】ウエハWを洗浄する場合には、まず処理液

Q_Aを処理液導入弁8_Aを介して基板処理槽１に循環させてオーバーフローさせつつウエハWを薬液処理する。引き続きその後で処理液Q_Aを給排液切換弁１３及び排液路４２の処理液回収弁44_Aを介して処理液貯留容器６に回収する。そして空になった基板処理槽１に純水導入弁２７を介して純水D_Wを供給して純水処理に移行する。純水をオーバーフローさせながらウエハWをリンスした後、純水を排出する。処理液Q_B・Q_Cについても、処理液Q_Aの場合と同様に循環させて薬液処理した後、ウエハWを基板処理槽１から引き上げる。

【００４７】上記純水処理では、基板処理槽１からオーバーフローした純水排液を排液弁４７を介して排液ドレン４３に廃棄する。その際、純水廃液は排液路４２の最奥部４２ａから排出されるので、排液路４２の内壁に残留する処理液は有効に洗い流される。また、基板処理槽１の底部の排出口４５及び給排液切換弁１３はクイックドレン可能に構成され、急速排出によりスループットを高めている。なお、いずれかの薬液処理においてＨＦ処理が含まれる場合には、前記のように基板処理槽１にＨＦを入れた状態で純水を供給し、オーバーフローさせることによりＨＦを純水に置換するとともに、最終リンスが完了した後に基板処理槽１から基板Wを引き上げる場合には、純水をオーバーフローさせながら行う。

【００４８】図５は本発明の実施形態５に係る浸漬処理装置の概略系統図を示し、同図(A)中の太線は薬液処理の場合の処理液経路を、同図(B)中の太線は純水処理の場合の純水経路及び処理液経路を示す。この浸漬処理装置は、前記浸漬処理部６５に単一の基板処理槽１を配設するとともに、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングと温度調整とを実行するためのものである。即ち、図５(A)(B)に示すように、処理液供給路７の処理液導入弁８と排液路４２の排液弁４７とを、それぞれ切換可能な三方弁で構成する。

【００４９】上記排液路４２の流通下手側を二股状に分岐して、一方の管路２１を排液ドレン４３に接続し、他方を処理液回収路２２として処理液貯留容器６に接続する。そして処理液導入弁８よりも下流側に純水供給路３を連通するとともに、圧送ポンプ１５と処理液導入弁８との間にフィルタ１０とインライン型のヒータ（以下「インラインヒータ」という）８１とを付設し、処理液供給路７と処理液回収路２２とを切換可能な処理液導入弁８を介して接続する。

【００５０】薬液処理が行われる場合には、図５(A)に示すように、基板処理槽１からオーバーフロー液回収部４１へオーバーフローした洗浄液は、処理液回収路２２を経て処理液貯留容器６に回収され、再び圧送ポンプ１５により吸い上げられ、フィルタ１０により濾過されてリフレッシュされた後、基板処理槽１に還流する。また、純水処理が行われる場合には、図５(B)に示すように、オーバーフローした純水は切換可能な排液弁４７及び排液路２１を介して排液ドレン４３に排出される。

【００５１】この純水処理中において、圧送ポンプ１５で汲み上げられた処理液は、フィルタ１０により濾過されてリフレッシュされた後、切換可能な処理液導入弁８を介して処理液回収路２２に流入し、再び処理液貯留容器６に還流する。上記構成により単一の基板処理槽１を用いる場合でも、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングが行われ、処理液をリフレッシュさせることができる。また、前記インラインヒータ８１は、例えば管路の外周にヒータを配設した構成を具備し、管路を通過する処理液を加熱する。このため、上述した純水処理中においても循環する処理液を均一な温度に調整しておくことができ、特に高温薬液処理を行う場合に、所定温度の処理液を基板処理槽内に供給して直ちに洗浄処理に移行することが可能になる。

【００５２】図６は本発明の実施形態６に係る浸漬処理装置の概略系統図を示し、同図(A)中の太線は薬液処理の場合の処理液循環経路を、同図(B)中の太線は純水処理の場合の純水経路及び処理液循環経路を示す。この浸漬処理装置も実施形態５(図５)と同様に処理液の循環フィルタリングと温度調整とを実行するものである。即ち、図６(A)(B)に示すように、実施形態５（図５）の浸漬処理装置において、上記処理液回収路２２に切換可能な処理液回収弁４４を付設するとともに、処理液供給路７の圧送ポンプ上流側と処理液回収路２２とを上記処理液回収弁４４を介して接続する。

【００５３】薬液処理が行われる場合には、図６(A)に示すように、基板処理槽１のオーバーフロー液回収部４１から、処理液は排液弁４７を介して処理液回収路２２を流下し、処理液貯留容器６を介さず上記処理液回収弁４４を介して処理液供給路７に流入し、フィルタ１０により濾過されてリフレッシュされるとともに、温度調整された後、再び基板処理槽１に還流する。一方、純水処理が行われる場合には、図６(B)に示すように、圧送ポンプ１５で汲み上げられた処理液は、フィルタ１０によりリフレッシュされるとともに、温度調整された後、処理液回収路２２を流下し、上記処理液回収弁４４を介して処理液貯留容器６に還流する。

【００５４】上記実施形態６においては、薬液処理が行われる際には、処理液は圧送ポンプ１５で吸引されて処理液回収路２２を流下することになるので、処理液回収路２２の管径が細くても単に落差で流下する実施形態５と比較して流下する処理液の流量は格段に多くなる。つまり、処理液回収路２２は管径の細いもので足りるという利点がある。

【００５５】図７は本発明の実施形態７に係る浸漬処理装置の概略系統図を示す。この実施形態７は、実施形態６(図６)と同様の浸漬処理装置を３組並設して構成したものである。この実施形態７では、図７に示すように、各基板処理槽１においてそれぞれ所定の処理液Q_A～Q_C

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により前記類型の薬液処理が別々に行われ、ウエハWを表面処理した各処理液Q_1～Q_cは、各処理液貯留容器６に回収されて再利用される。また、循環フィルタリングにより各処理液Q_1～Q_cをリフレッシュさせることやインラインヒータ８１により各処理液Q_1～Q_cの温度調整を行うこともできる。

【００５６】図８は本発明の実施形態８に係る浸漬処理装置の概略系統図を示す。この浸漬処理装置は、実施形態７(図７)において基板処理槽１のうちの１槽を、純水処理用のリンス専用槽に設定したものであり、他の２組において、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングや温度調整を実行する点は実施形態６(図６)と同様である。この実施形態８では、２個の基板処理槽１の夫々で処理液Q_1又はQ_2による薬液処理が施された後、引き続き軽く純水処理が行なわれ、さらにリンス専用槽１で純水D_wによる純水処理が行われる。これにより、各基板処理槽１で薬液処理と純水処理を順次行う場合に比べて、強力にウエハWをリンスでき、純水処理の所要時間が短縮されてスループットが向上する。

【００５７】図９及び図１０は本発明の実施形態９に係る浸漬処理装置の概略系統図を示し、図９中の太線は薬液処理の場合の処理液循環経路を、図１０中の太線は純水処理の場合の純水経路及び処理液循環経路を示す。この実施形態９は、単一の基板処理槽１を用いる点で、また、薬液処理及び純水処理が行われる間に処理液の循環フィルタリングや温度調整を実行する点で実施形態６(図６)と共通する。

【００５８】この実施形態９では、図９及び図１０中の処理液供給路７のうち、そのポンプ上流側の開閉弁９と処理液導入弁８との間は、処理液回収時において処理液回収路２２をも兼ねる。図９において、薬液処理が行われる場合には、処理液供給路７の上記開閉弁９と処理液導入弁８と、排液路４２の切り換え可能な排液弁４７ａが開弁され、その他の弁は閉弁される。処理液Qは基板処理槽１内に満たされて十分にオーバーフローするまで圧送ポンプ１５より汲み上げられる。

【００５９】その後処理液供給路７のポンプ上流側の開閉弁９は閉止される。基板処理槽１からオーバーフローした処理液Qは、オーバーフロー回収部４１から排液路４２及び排液弁４７ａを介して処理液回収路２２を流下し、処理液貯留容器６を介さないで処理液供給路７のポンプ上流側に流入し、再び圧送ポンプ１５で汲み上げられ、フィルタ１０により濾過されてリフレッシュされた後、基板処理槽１に還流する。つまり、基板の薬液処理が行われる間に処理液の循環フィルタリングが行われる。

【００６０】薬液処理が終了すると、処理液供給路７の上記開閉弁９と処理液導入弁８は閉弁され、排液路４２の排液弁４７ａ及び処理液供給路７と処理液回収路２２

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とを連通する給排液切換弁１３が開弁される。さらに、圧送ポンプ１５と処理液導入弁８との間において導出された後段の処理液回収路２２ａが処理液回収弁４４を介して処理液貯溜容器６に連通され、その他の弁は閉弁される。そして基板処理槽１内の処理液Qは、処理液回収路２２→処理液供給路７の上流側→圧送ポンプ１５→後段の処理液回収路２２ａ→処理液回収弁４４を経て処理液貯留容器６内に回収される。

【００６１】図１０において、処理液の回収を終えて純水処理に移行する場合には、上記開閉弁９が開弁され、給排液切換弁１３は閉弁され、排液路４２の排液弁４７ａは排液ドレン４３ａ側に切り換えられる。処理液貯留容器６内に回収された処理液Qは、圧送ポンプ１５で汲み上げられ、フィルタ１０→上記処理液回収路２２ａ→処理液回収弁４４を介して循環フィルタリングが行われる。

【００６２】次いで、給排液切換弁１３は閉弁され、排液路４２の第１排液弁４７ａは排水用のドレン４３ａ側に切り換えられ、純水供給路３ａの純水導入弁２７が開弁される。純水D_wは基板処理槽１内に満たされてオーバーフローしつつ、ウエハをリンスする。基板処理槽１からオーバーフローした純水D_wは、オーバーフロー回収部４１→排液路４２→第１の排液弁４７ａ→第２の排液弁４７ｂ→排水用排液路２１ａを経て排水用ドレン４３ａに排出される。そしてウエハの純水処理の間も処理液の循環フィルタリングが行われる。

【００６３】この実施形態９は、上述した循環フィルタリングの他に、下記のような豊富な機能を備えている。図９及び図１０に示すように、上記基板処理槽１は排液槽２内の超音波洗浄部３４の上側に設置されており、超音波発振器３５により超音波洗浄部３４を介してウエハを強力に洗浄しすることができる（以下、超音波洗浄機能という）。上記純水供給路３は、処理液供給路７に接続される純水導入路３ａとシャワーパイプ１７に接続されるシャワー導入路３ｂとに分岐され、純水導入路３ａには純水導入弁を構成するユニット弁２７が付設され、シャワー導入路３ｂには同様のユニット弁２８が付設される。この純水シャワーは、薬液処理をする前にウエハを純水で軽く洗浄する場合に用いられる（以下純水シャワー機能という)。なお、ユニット弁２７・２８からの余剰の純水は後述する純水回収用ドレン４３ｂに分離排出される。

【００６４】上記排液路４２は、切り替え可能な第１排液弁４７ａを介して排水路２１と処理液回収路２２とに分岐される。上記排水路２１は第２排液弁４７ｂを介して排水用排液路２１ａと回収用排液路２１ｂに分岐される。排水用排液路２１ａは排水用ドレン４３ａに、回収用排液路２１ｂは純水回収用ドレン４３ｂに接続される。上記基板処理槽１には急速排水用のクイックドレン弁３２が付設されており、純水排液を基板処理槽１から

排出する際には、クイックドレン弁３２を開けて純水排液を排液槽２内に流下させ、第１排液弁４７ａと第２排液弁４７ｂを適宜切り換え操作して排水用ドレン４３ａ又は純水回収用ドレン４３ｂに分離排出させる（以下排水の分離排出機能という）。

【００６５】上記処理液供給路７は、純水導入路３ａの接続部と処理液導入弁８との間において、給排切換弁１３を介して処理液回収路２２に連通され、処理液回収路２２の下端は処理液供給路７に付設された開閉弁９と圧送ポンプ１５との間に連通される。さらに、圧送ポンプ１５と処理液導入弁８との間において、後段の処理液回収路２２ａと処理液排液路２１ｃとが導出される。後段の処理液回収路２２ａは処理液回収弁４４を介して処理液貯溜容器６に連通され、処理液排液路２１ｃは第３排液弁４７ｃを介して処理液回収用ドレン４３ｂに接続される。

【００６６】処理液Ｑを処理液貯溜容器６に回収する場合には、前記のように、基板処理槽１→処理液供給路７→給排液切換弁１３→処理液回収路２２→圧送ポンプ１５→フィルタ１０→第２の処理液回収路２２ａ（処理液回収弁４４）を経て処理液Ｑを処理液貯溜容器６に回収する。また、用尽した処理液Ｑを廃棄する場合には、上記処理液回収路２２ａの処理液回収弁４４を閉弁するとともに第３排液弁４７ｃを開き、圧送ポンプ１５により処理液Ｑを処理液回収用ドレン４３ｃに排出する。これにより、処理液Ｑは処理液貯溜容器６と処理液回収用ドレン４３ｃとに分離排出される（以下処理液の分離排出機能という）。

【００６７】上記基板処理槽１及び処理液貯留容器６内には恒温ヒータ５が浸漬配置され、上述した循環フィルタリングと相俟って処理液を均一な温度に調節できる（以下処理液の恒温維持機能という）。これにより、特に高温薬液処理においては、所定温度の処理液Ｑを基板処理槽１内に供給して直ちに洗浄処理をすることが可能になり、スループットが向上する。また、上記基板処理槽１内にはバブリング手段２４が浸漬配置され、基板の洗浄処理に際して、ガス供給路２３よりN_2ガスを供給して均一な処理液Ｑの均一な上昇流を形成するとともに、洗浄処理を促進するように構成されている（以下処理液のバブリング機能という）。このガス供給路２３には、ガス導入用のユニット弁３７とガスフィルタ３８が付設されている。

【００６８】上記処理液貯溜容器６には、複数の薬液導入弁４８ａ・４８ｂ・４８ｃを介してそれぞれ薬液q_1・q_2・q_3を注入し得るように構成されており、これらの薬液q_1・q_2・q_3を調合して所要の処理液を作ることができる（以下処理液の調合機能という）。なお、上記基板処理槽１及び処理液貯溜容器６には、処理液Ｑの液面レベルや残量、温度等を検出する各種の検知器１８が設けられている。

【００６９】図１１、図１２及び図１３は、それぞれ本発明の実施形態１０に係る浸漬処理装置の概略系統図を示し、図１１中の太線は薬液処理の場合の処理液循環経路を、図１２及び図１３中の太線はそれぞれ純水処理の場合の純水経路及び処理液循環経路を示す。この浸漬処理装置は、単一の基板処理槽１に対して処理液の異なる複数の処理液貯溜容器6_A・6_Bを設け、処理液供給路７$_A$・７$_B$及び処理液回収路２２ａ・２２ｂを各処理液貯溜容器6_A・6_Bに対して切り換え可能に構成した点が上記実施形態９と基本的に異なる。

【００７０】この実施形態１０では、実施形態９と同様に処理液供給路７の一部分（開閉弁９ａと処理液導入弁８との間）が、処理液回収中における処理液回収路２２をも兼ねる。また、上記処理液供給路７に複数の処理液貯溜容器6_A・6_Bを切り換え可能に接続する開閉弁９ａ・９ｂは、処理液選択弁８２でもある。さらに、処理液回収路２２を兼ねる処理液供給路７の一部分（開閉弁９ａと処理液導入弁８との間）に複数の処理液貯溜容器6_A・6_Bを切り換え可能に接続する処理液回収弁４４ａ・４４ｂは処理液戻選択弁８３でもある。

【００７１】上記基板処理槽１及びオーバーフロー回収部４１にそれぞれ急速排水用のクイックドレン弁３２、３３が付設されており、基板処理槽１及びオーバーフロー回収部４１を空にする場合には迅速に排液し得るように構成されている。また、フィルタ１０の一次室と上記オーバーフロー回収部４１とが、連通路８５により逆止弁８６を介して連通されており、フィルタ１０の目詰まりが生じた場合には、処理液をオーバーフロー回収部４１に圧送し得るように構成されている。

【００７２】図１１において、処理液Q_Aによる薬液処理が行われる場合には、処理液供給路７上流側の第１の開閉弁９ａと、処理液導入弁８と、その下流側の開閉弁１４と、切り換え可能な第１排液弁４７ａが開弁され、その他の弁は閉弁される。処理液Q_Aは基板処理槽１内に満たされて十分にオーバーフローするまで圧送ポンプ１５より汲み上げられ、その後開閉弁９ａは閉弁され、第１排液弁４７ａは開弁される。基板処理槽１からオーバーフローした処理液Q_Aは、オーバーフロー回収部４１→排液路４２→第１排液弁４７ａ→処理液回収路２２→処理液供給路７のポンプ上流側→圧送ポンプ１５→フィルタ１０→処理液導入弁８→開閉弁１４を経て基板処理槽１還流する。つまり、処理液の循環フィルタリングを実行しつつウエハの薬液処理が行われる。

【００７３】薬液処理が終了すると、処理液供給路７上流側の開閉弁９ａ・９ｂと処理液導入弁８は閉弁され、排液路４２の第１排液弁４７ａと、処理液供給路７と処理液回収路２２とを連通する給排液切換弁１３が開弁される。さらに、圧送ポンプ１５と処理液導入弁８との間において導出された別の処理液回収路２２ａが処理液回収弁４４を介して処理液貯溜容器６に連通される。その

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他の弁は閉弁され、基板処理槽１内の処理液Ｑは処理液貯留容器６内に回収される。

【００７４】処理液の回収を終えて純水処理に移行する場合には、図１２に示すように、開閉弁９ａが開弁され、給排液切換弁１３は閉弁され、排液路４２の第１排液弁４７ａは排水用ドレン４３ａ側に切り換えられる。処理液貯留容器6_A内に回収された処理液Q_Aは、圧送ポンプ１５で汲み上げられてフィルタ１０、第２の処理液回収路２２ａを介して循環フィルタリングが行われる。次いで給排液切換弁１３は閉弁され、排液路４２の第１排液弁４７ａは排水用のドレン４３ａ側に切り換えられ、純水供給路３ａの純水導入弁２７が開弁され、純水D_Wは基板処理槽１内に満たされてオーバーフローしつつ、基板Ｗをリンスする。基板処理槽１からオーバーフローした純水D_Wは、オーバーフロー回収部４１→排液路４２→第１の排液弁４７ａ→第２排液弁４７ｂを経て排水用ドレン４３ａに排出される。そして基板の純水処理の間も処理液Q_Aの循環フィルタリングが行われる。

【００７５】図１３において、処理液Q_Bによる薬液処理が行われる場合には、上記基板処理槽１に連通する後段の処理液供給路７ｂ対して別の開閉弁１９ｂ（処理液選択弁８２）を介して処理液貯溜容器6_Bが接続され、この処理液貯溜容器6_Bに対して別の処理液回収弁４４ｂ（処理液選択弁８３）を介して処理液回収路２２ｂが接続される。つまり、ウエハの薬液処理が行われる時には、図１１に示すのと同様に、処理液の循環フィルタリングが実行され、ウエハの純水処理が行われる時には、図１３において処理液Q_Bの循環フィルタリングが実行される。なお、この実施形態１０においても、実施形態９（図９）と同様に超音波洗浄機能、純水シャワー機能、純水の分離排出機能、処理液の分離排出機能、及び処理液恒温機能を発揮するように構成されている。

【００７６】図１４及び図１５は、それぞれ本発明の実施形態１１に係る浸漬処理装置の概略系統図を示し、図１４中の太線は薬液処理の場合の処理液循環経路を、図１５中の太線は純水処理の場合の純水経路及び処理液循環経路を示す。この浸漬処理装置は、複数の基板処理槽1_A・1_Bに対して処理液の異なる複数の処理液貯溜容器6_A・6_Bを設け、処理液供給路7_A・7_B及び処理液回収路２２ａ・２２ｂを各基板処理槽1_A・1_B及び処理液貯溜容器6_A・6_Bに対して切り換え可能に構成した点が上記実施形態１０と異なり、その他の点は実施形態１０と同様に構成されている。なお、既述の部材については同一の符号を付して重複する説明を省略する。

【００７７】この浸漬処理装置では、図１４に示すように、各基板処理槽１においてそれぞれ処理液Q_A及び処理液Q_Bによる薬液処理と純水処理が適宜選択的に並行して行われる。その場合の薬液処理や純水処理は、実施形態１０に準じて行われる。即ち、薬液処理が行われる場合には、図１４に示すように、各処理液Q_A・Q_Bはそ

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れぞれの基板処理槽１内に満たされ、オーバーフローした処理液Q_A・Q_Bは、オーバーフロー回収部４１→排液路４２→第１排液弁４７ａ→処理液回収路２２→処理液供給路７のポンプ上流側→圧送ポンプ１５→フィルタ１０→処理液導入弁８→開閉弁１４を経て基板処理槽１還流する。つまり、処理液の循環フィルタリングを実行しつつウエハの薬液処理が行われる。

【００７８】処理液の回収を終えて純水処理に移行する場合には、図１５に示すように、各基板処理槽１内の処理液Q_A・Q_Bはそれぞれ処理液貯留容器6_A・6_B内に回収される。処理液貯留容器6_A・6_B内に回収された処理液Q_A・Q_Bは、それぞれ圧送ポンプ１５で汲み上げられて、フィルタ１０と後段の処理液回収路２２ａを介して循環フィルタリングが行われる。純水D_Wはそれぞれの基板処理槽１内に満たされてオーバーフローしつつ、ウエハをリンスする。各基板処理槽１からオーバーフローした純水D_Wは、それぞれオーバーフロー回収部４１→排液路４２→第１の排液弁４７ａ→第２排液弁４７ｂを介して排水用ドレン４３ａに排出される。そしてウエハの純水処理の間も処理液Q_A・6_Bの循環フィルタリングが行われる。

【００７９】上記実施形態１１では、２つの基板処理槽と２つの処理液貯溜容器とを選択的に接続するものについて例示したが、それらの基板処理槽と処理液貯溜容器とをさらに増やすこともできる。その場合には各基板処理槽により複数の薬液処理を並行して実行できるので、一層スループットが向上するまた、各基板処理槽において処理液Q_A及び処理液Q_Bによる薬液処理と純水処理が適宜選択的に並行して行われるものとして説明したが、各基板処理槽毎にそれぞれ専用の薬液処理を行うようにしてもよい。

【００８０】

【発明の効果】請求項１及び請求項２の発明では、前記のように構成され作用することから、基板処理槽からオーバーフローした処理液は、処理液回収弁及び処理液回収路を介して処理液貯留容器に回収され、再び基板処理槽に循環して再利用できるので、処理液の消費量が大幅に減らすことができる。また、単一の基板処理槽で薬液処理と純水処理とを実行できるので、基板処理装置の大型化を防止することができる。さらに、薬液処理から純水処理への移行に際して、基板処理槽内に処理液が入った状態で純水を供給してオーバーフローさせることにより、処理液を純水に置き換えるので、基板は空気に触れることなく、薬液処理から純水処理へ移行することができる。これにより、基板表面に酸化皮膜が形成されるのを防止できる。

【００８１】請求項３の発明では、前記のように構成され作用することから、薬液処理及び純水処理が行われる間に処理液はフィルタリングにより効果的にリフレッシュされる。

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【図面の簡単な説明】

【図１】実施形態１に係る浸漬処理装置の概略系統図を示す。

【図２】実施形態２に係る浸漬処理装置の概略系統図を示す。

【図３】実施形態３に係る浸漬処理装置の概略系統図を示す。

【図４】図４(A)は実施形態４を示す浸漬処理装置の概略系統図であり、図４(B)は図４(A)のB部を、図４(C)は図４(A)のC部を夫々示す液通路の要部縦断面図である。

【図５】実施形態５に係る浸漬処理装置の概略系統図を示す。

【図６】実施形態６に係る浸漬処理装置の概略系統図を示す。

【図７】実施形態７に係る浸漬処理装置の概略系統図を示す。

【図８】実施形態８に係る浸漬処理装置の概略系統図を示す。

【図９】実施形態９に係る浸漬処理装置の概略系統図を示す。

【図１０】実施形態９に係る浸漬処理装置の概略系統図を示す。

【図１１】実施形態１０に係る浸漬処理装置の概略系統図を示す。

【図１２】実施形態１０に係る浸漬処理装置の概略系統図を示す。

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【図１３】実施形態１０に係る浸漬処理装置の概略系統図を示す。

【図１４】実施形態１１に係る浸漬処理装置の概略系統図を示す。

【図１５】実施形態１１に係る浸漬処理装置の概略系統図を示す。

【図１６】本発明の浸漬処理装置を適用した基板処理装置の概略斜視図である。

【図１７】同基板処理装置の概略平面図である。

【図１８】同基板処理装置の概略縦断面図である。

【図１９】従来技術に属する基板処理装置の概略平面図である。

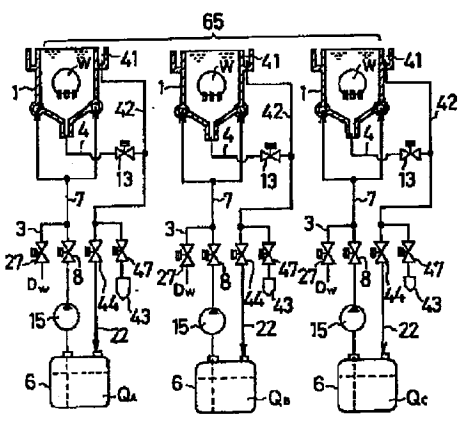
【図２０】従来例１に係る浸漬処理装置を示し、同図(A)は薬液処理の概略系統図、同図(B)は純水処理の概略系統図である。

【図２１】従来例２を示す浸漬処理装置の概略説明図である。

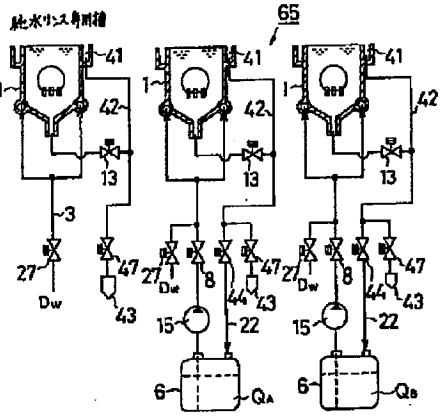
【符号の説明】

１…基板処理槽、３…純水供給路、６…処理液貯留容器、７…処理液供給路、８…処理液導入弁、１５…圧送ポンプ、２２…処理液回収路、２７…純水導入弁、４２…排液路、４３…排液ドレン、４４…処理液回収弁、４７…排液弁、D_w…純水、ＱＡ～ＱＥ…処理液、Ｗ…基板。

【図１】



【図２】



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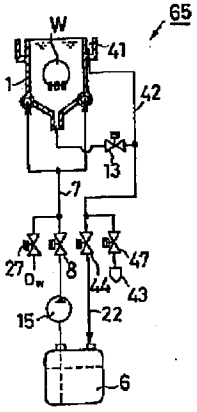

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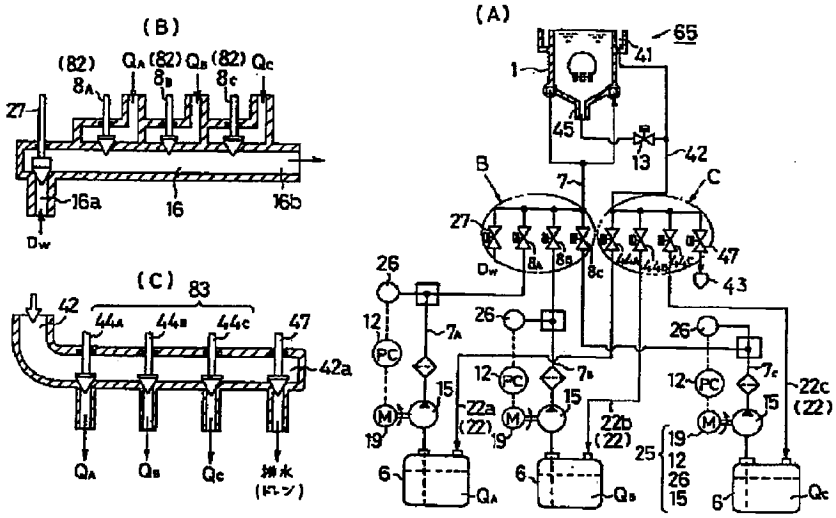
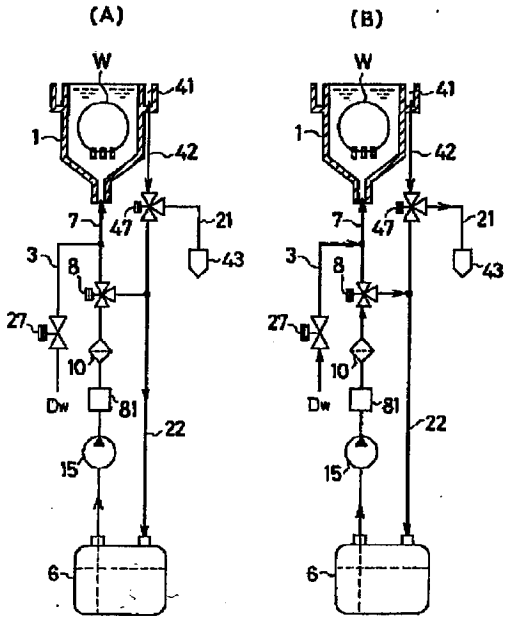
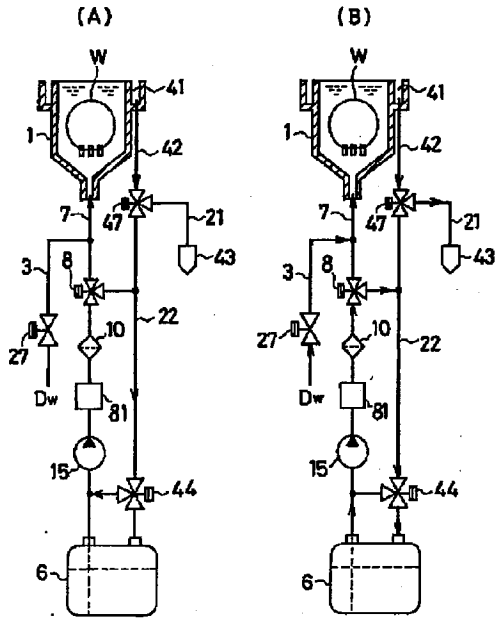

(B)
(82) 8A
QA
(82) 8B
QB
(82) 8C
QC
27
16a
16
16b
Dw
(C)
83
42
44A
44B
44C
47
42a
QA
QB
QC
排水
(ドレン)
(A)
65
41
1
45
13
42
B
C
7
27
47
43
26
12
PC
7A
7B
7C
15
M
19
22a
(22)
22b
(22)
22c
(22)
6
25

【図５】


(A)
(B)
W
41
1
42
7
47
21
43
3
8
27
10
Dw
81
22
15
6

【図６】


(A)
(B)
W
41
1
42
7
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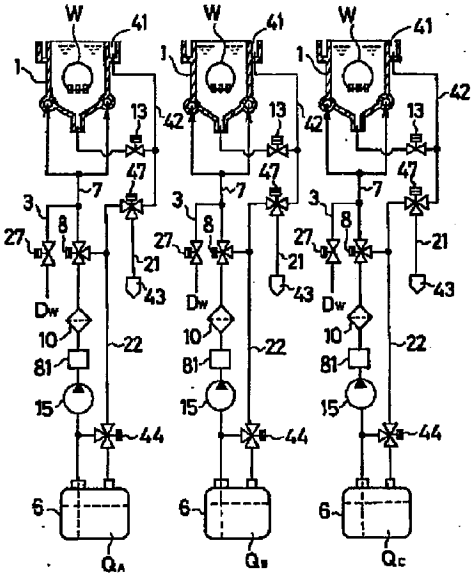
43
3
8
27
10
22
Dw
81
15
44
6

【図７】



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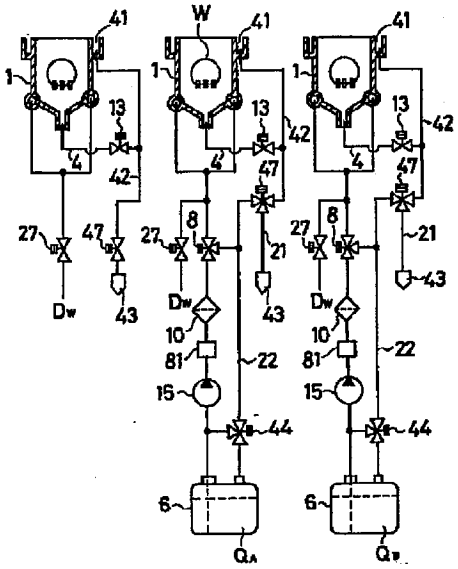

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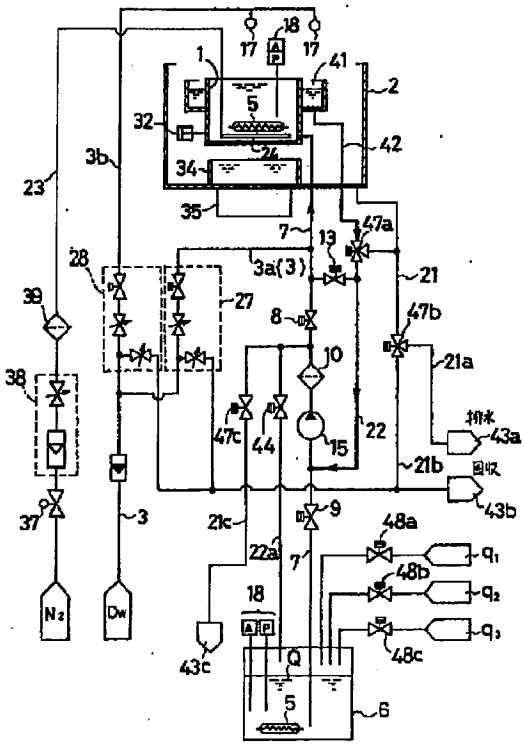
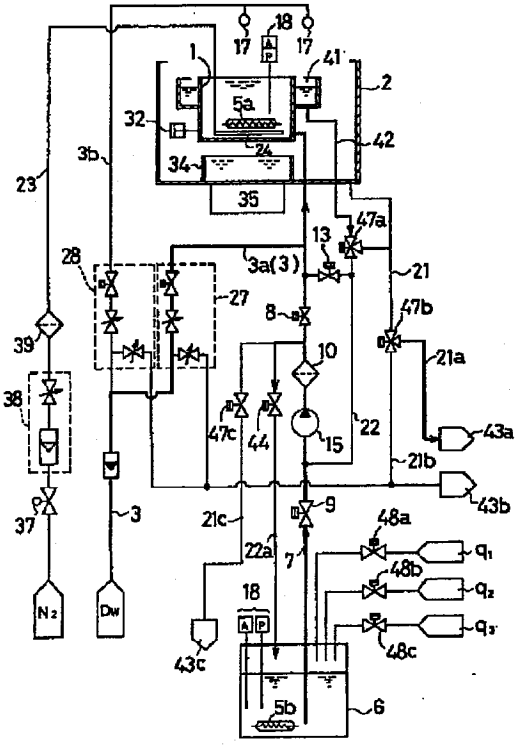
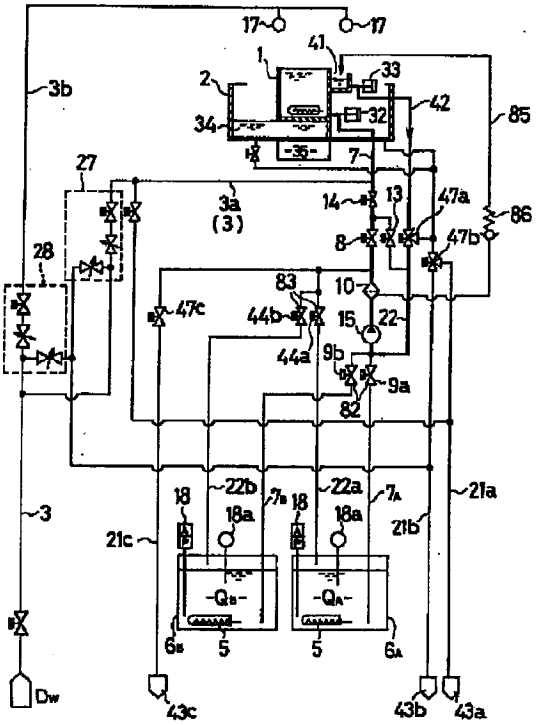


【図１０】



【図１１】



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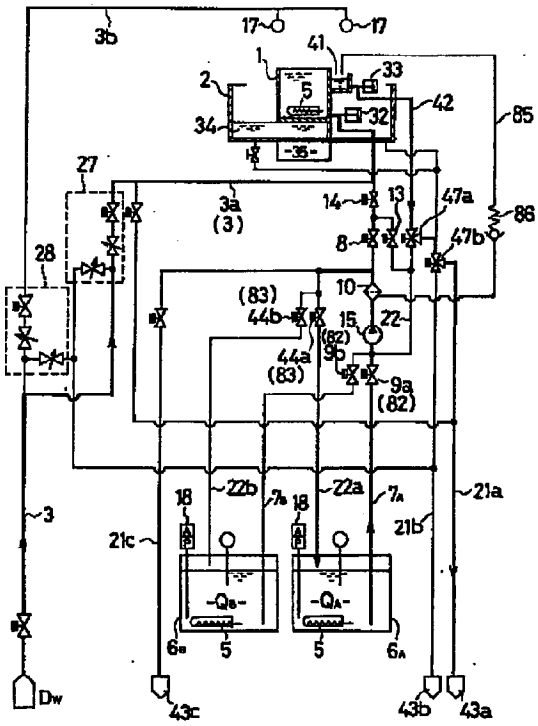

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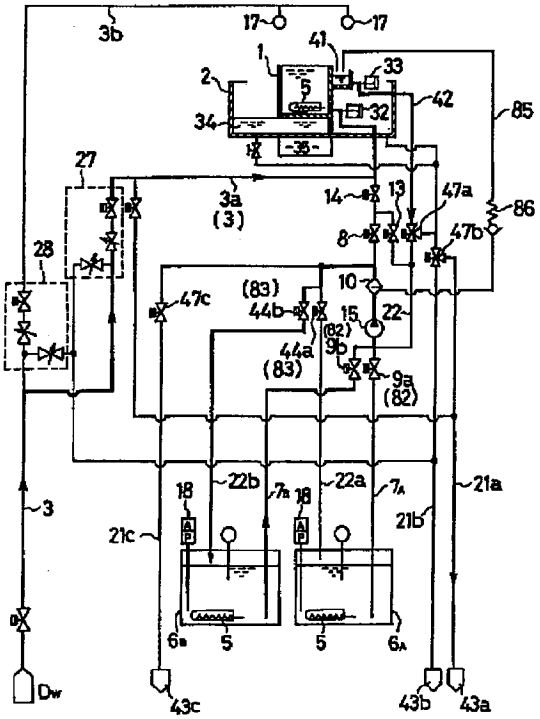
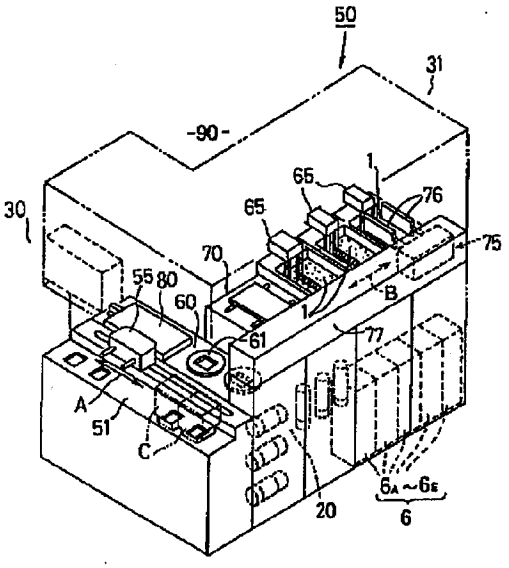
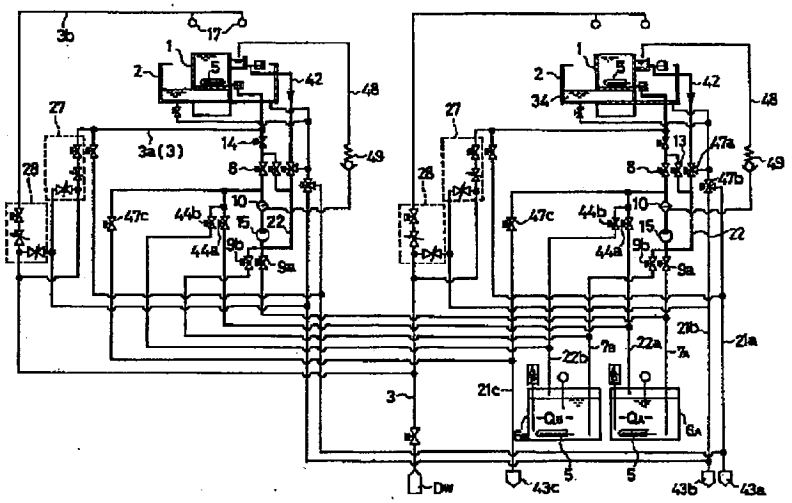


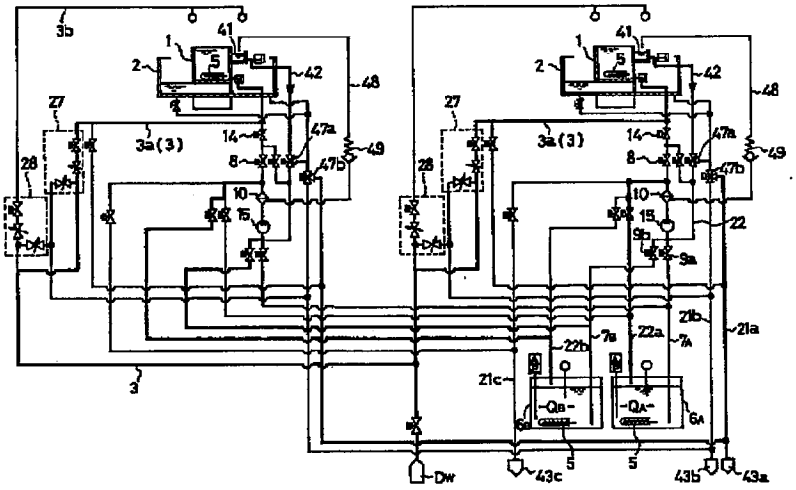
【図１６】



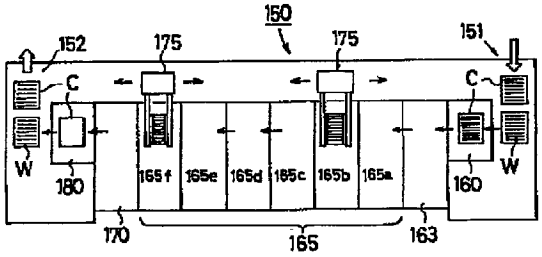
【図１４】


3b
17
1
2
42
48
27
3a(3)
14
8
49
28
47c
44b
10
15
22
44a
9b
9a
34
13
47a
47b
21b
21a
22b
7a
22a
7A
21c
3
Qa
Qb
6A
6a
5
Dw
43c
43b
43a

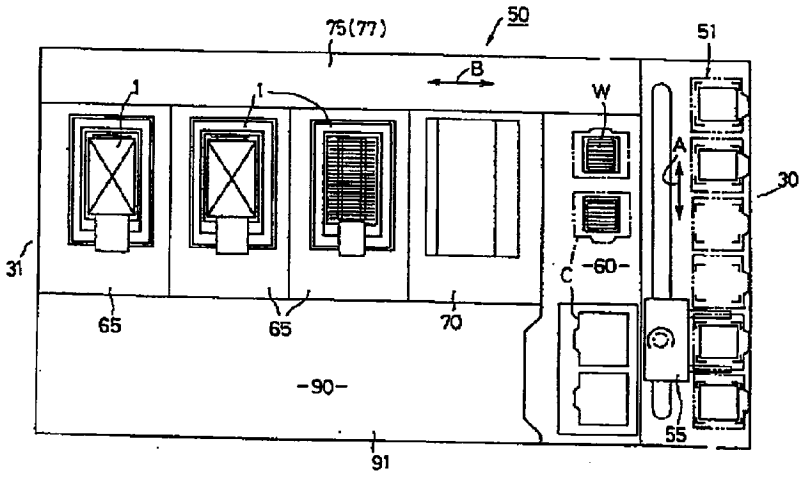
【図１５】


3b
41
1
2
42
48
27
3a(3)
14
47a
8
47b
49
28
10
15
22
9b
9a
21b
21a
22b
7a
22a
7A
21c
3
Qa
Qb
6A
6a
5
Dw
43c
43b
43a

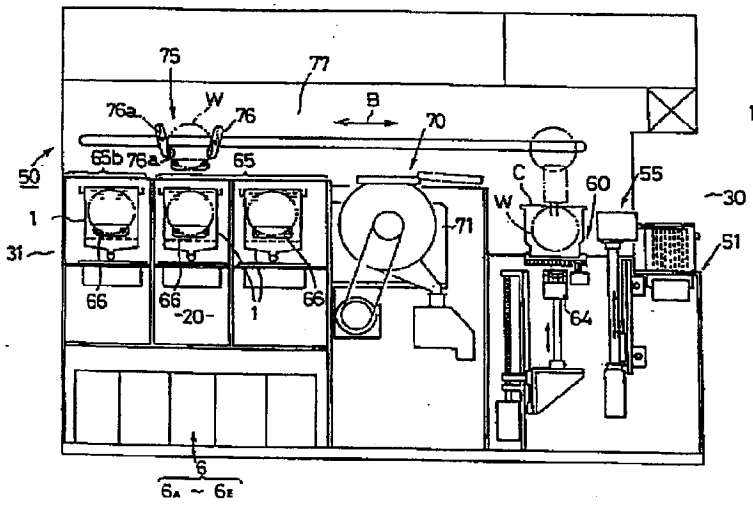
【図１９】


150
152
175
175
151
C
C
W
W
180
160
165f
165e
165d
165c
165b
165a
170
165
163

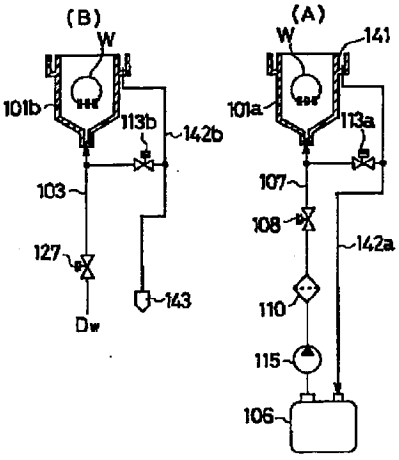
【図１７】


75(77)
50
51
B
W
A
30
1
1
C
-60-
31
65
65
70
-90-
55
91

【図１８】


75
77
76a
W
76
B
70
50
65b
76a
65
C
60
55
30
1
W
71
51
31
66
66
-20-
1
66
64
6
6A ~ 6E

【図２０】


(B)
W
101b
113b
142b
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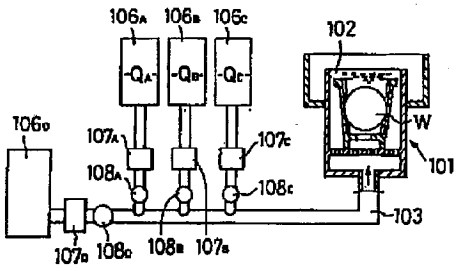
Dw
(A)
W
141
101a
113a
107
108
142a
110
115
106

【図２１】



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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-058492
(43)Date of publication of application : 25.02.2000

(51)Int.Cl. H01L 21/304

(21)Application number : 11-233723
(22)Date of filing : 28.06.1994

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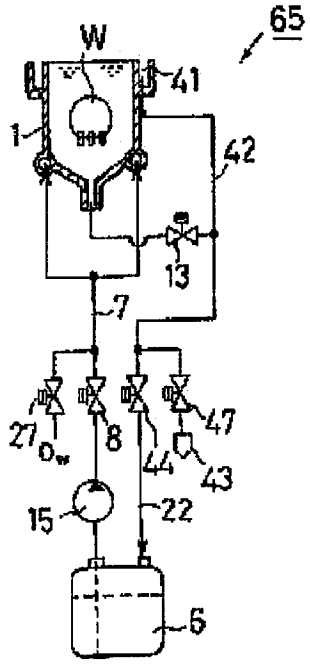
MAEKAWA NAOTADA

(30)Priority
Priority number : 05215129 Priority date : 06.08.1993 Priority country : JP

(54) IMMERSION PROCESSING SYSTEM FOR SUBSTRATE

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce running cost by suppressing consumption of processing liquid in an immersion processing system performing surface treatment of a semiconductor substrate, or the like, while preventing the size of the immersion processing system from increasing.
SOLUTION: A liquid discharge path 42 led out from an overflow type substrate processing bath 1 is branched into a path being coupled with a drain 43 through a liquid discharge valve 47 and a processing liquid collecting path 21 being coupled with a processing liquid storage container 6 through a processing liquid collecting valve 44. Every time when a plurality of kinds of surface treatment are conducted, processing liquid flowing over the substrate processing bath 1 is collected in the storage container 6 through the processing liquid collecting valve 44 and reused. At the time of transfer from chemical processing to pure water processing, pure water is supplied under a state where the processing liquid is placed in the substrate processing bath. The processing liquid is overflowed and replaced by pure water and the substrate is kept away from the air thus preventing formation of oxide film on the surface of the substrate.



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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]While the above-mentioned effluent way is branched and one side is open for free passage to an effluent drain via an effluent valve in a dipping processor of a substrate characterized by comprising the following, Another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and in a chemical treatment. Supply a treating solution in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned chemical treatment. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned chemical treatment is faced, A dipping processor of a substrate characterized by what a treating solution in the above-mentioned substrate treatment tub is transposed for to pure water by making pure water supply and overflow where it suspended supply of a treating solution, then a treating solution is put into the above-mentioned substrate treatment tub.
An overflowed type substrate treatment tub which immerses a substrate into a treating solution and makes a surface treatment of a substrate.
A treating solution supply route connected with the above-mentioned substrate treatment tub.
A treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage.
A purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain.

[Claim 2]While the above-mentioned effluent way is branched and one side is open for free passage to an effluent drain via an effluent valve in a dipping processor of a substrate characterized by comprising the following, Another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and in HF processing. Supply HF in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned HF processing. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned HF processing is faced, A dipping processor of a substrate characterized by what HF in the above-mentioned substrate treatment tub is transposed for to pure water by suspending supply of HF, then making the above-mentioned

substrate treatment tub supply and overflow pure water in the state of HF ON ****.
An overflowed type substrate treatment tub which immerses a substrate into a treating solution and makes a surface treatment of a substrate.
A treating solution supply route connected with the above-mentioned substrate treatment tub.
A treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage.
A purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain.

[Claim 3]In a dipping processor of the substrate according to claim 1 or 2, while attaching a filter between a feeding pump of said treating solution supply route, and said treating solution introduction valve, Rather than a treating solution introduction valve, open a purified water supply route for free passage to the downstream, connect between a feeding pump of the above-mentioned treating solution supply route, and a purified water supply route terminal area, and a treating solution recovery passage in pure water processing. A dipping processor of a substrate characterized by what a treating solution recovery passage is circulated and a treating solution pumped up with a feeding pump is refluxed for to the above-mentioned treating solution storage container.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the dipping processor of the substrate used for carrying out the surface treatment of the laminated substrates (a substrate is only called below), such as a semiconductor wafer and a glass substrate for liquid crystals, in the dipping treatment part of a substrate processing device.
[0002]
[Description of the Prior Art]As a dipping processor of the substrate which there are some which are conventionally shown in drawing 19 as the above-mentioned substrate processing device, and is used in the dipping treatment part 165, The thing (henceforth the conventional example 1) shown in drawing 20 or the thing (henceforth the conventional example 2) which it was indicated by JP,4-42531,A and shown in drawing 21 is known. Drawing 19 is a top view of the whole substrate processing device here.
[0003]The carrying in part 151 of the cassette C by which this substrate processing device 150 accommodated the substrate W as shown in drawing 19, The substrate extraction part 160 which picks out the substrate W from the cassette C, and the substrate transfer robot 175 which does package maintenance and conveys two or more substrates W, The zipper washing section 163 which washes the substrate transfer robot's 175 chuck hand, Two or more dipping treatment parts 165 which immerse and process sequentially two or more substrates W held by the robot 175 concerned, It comprises the dryer part 170 arranged at the backside of the dipping treatment part 165, the substrate containing section 180 which stores the processed substrate W into the cassette C, and the carrying out portion 152 which takes out the cassette C which stored the substrate W.
[0004]And a dipping processor as shown, for example in drawing 20 (A) and (B) is arranged, and it is constituted by the above-mentioned dipping treatment part 165 so that various kinds of surface treatments may be made. Drawing 20 (A) is a dipping processor of the substrate for carrying out the surface treatment (henceforth a chemical treatment) according the substrate W to two or more sorts of treating solutions, and drawing 20 (B) is a dipping processor for carrying out rinsing treatment (henceforth pure water processing) according the substrate W concerned to pure water D_W. These dipping processors are arranged suitably at either of the above-mentioned dipping treatment parts 165 (165a-165f).
[0005]The overflowed type substrate treatment tub 101a which the dipping processor of drawing 20 (A) immerses the substrate W into a treating solution, and carries out a surface treatment, The treating solution supply route 107 connected with the substrate treatment tub 101a, and the treating solution storage container 106 which passed the treating solution introduction valve 108, the filter 110, and the feeding pump 115 to the treating solution supply route 107 in order, and was open for free passage, The recovery passage 142a which collects the treating solutions overflowed from the substrate treatment tub 101a to the treating solution storage container 106, It is constituted so that the treating solution which possessed the feeding-and-discarding change-over valve 113a which opens the treating solution supply route 107 and the recovery passage 142a for free passage so that opening and closing are possible, and was overflowed from

the substrate treatment tub 101a on the occasion of the chemical treatment may be refluxed to the treating solution storage container 6.

[0006]The dipping processor of drawing 20 (B) The overflowed type substrate cleaning tank 101b, The purified water supply route 103 connected with the substrate cleaning tank 101b, and the pure water introduction valve 127 provided in the purified water supply route 103, The drainage ditch 142b which derives the pure water overflowed from the substrate cleaning tank 101b to the wastewater drain 143, It is constituted so that the wastewater which possessed the feeding-and-discarding change-over valve 113b which opens the purified water supply route 103 and the drainage ditch 142b for free passage so that opening and closing are possible, and was overflowed from the substrate cleaning tank 101b on the occasion of pure water processing may be discharged to the drain 143.

[0007]On the other hand, as shown in drawing 21, the conventional example 2 supplies two or more sorts of treating solutions 102 one by one in the single substrate treatment tub 101, and is made to perform the surface treatment of the substrate W. Namely, the overflowed type substrate treatment tub 101 which immerses two or more substrates W into the treating solution 102, and makes the surface treatment of the substrate W, The treating solution supply route 103 which supplies two or more treating solutions 102 of a seed from the lower part of the substrate treatment tub 101, Two or more treating solution storage container 106_A which was open for free passage via treating solution introduction valve 108_A - 108_C and flow-regulator 107_A - 107_C, respectively to the treating solution supply route 103 - 106_C, It has pure water supply source 106_D which was open for free passage via pure water introduction valve 108_D and flow-regulator 107_D, It is constituted so that opening and closing control of each introduction valve 108_A - the 108_D may be carried out selectively and predetermined treating solution Q_A - Q_C may be supplied to the substrate treatment tub 101.

[0008]Chloride Q_B, etching agent Q_C like [106_C] hydrogen fluoride, etc. are stored by treating solution storage container 106_A at hydrogen peroxide Q_A and 106_B among the above-mentioned treating solution storage container 106_A - 106_C. And the substrate treatment tub 101 is constituted for two or more of these sorts of every surface treatments as an overflowed type processing tub in which the substitution of the treating solution 102 is possible, and the overflowing treating solution is discharged to a drain (graphic display abbreviation).

[0009]

[Problem(s) to be Solved by the Invention]Since the dipping processor of drawing 20 (A) and (B) is arranged at each dipping treatment parts [165a-165f] each, the above-mentioned substrate processing device 150 has the difficulty that the whole device is enlarged. Since the conventional example 2 discards to a drain the treating solution by two or more treating solutions overflowed from the substrate treatment tub 101 for every chemical treatment, the amount of consumption of a treating solution increases and the running cost of the whole substrate processing device becomes expensive. This invention makes it a technical technical problem to have been made in view of such a situation, to prevent and combine that a substrate processing device is enlarged, and to aim at reduction of a running cost.

[0010]

[Means for Solving the Problem]The invention according to claim 1 is provided with the following composition in order to solve said technical problem. Namely, an overflowed type substrate treatment tub which immerses a substrate into a treating solution and makes a surface treatment of a substrate, A treating solution supply route connected with the above-mentioned substrate treatment tub, and a treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage, In a dipping processor of a substrate possessing a purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain,

While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in a chemical treatment. Supply a treating solution in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned chemical treatment. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned chemical treatment is faced, By making pure water supply and overflow, where it suspended supply of a treating solution, then a treating solution is put into the above-mentioned substrate treatment tub, A treating solution in the above-mentioned substrate treatment tub is transposed to pure water.

[0011]An overflowed type substrate treatment tub which the invention according to claim 2 immerses a substrate into a treating solution, and makes a surface treatment of a substrate, A treating solution supply route connected with the above-mentioned substrate treatment tub, and a treating solution storage container which passed a treating solution introduction valve and a feeding pump to the above-mentioned treating solution supply route in order, and was open for free passage, In a dipping processor of a substrate possessing a purified water supply route which was open for free passage via a pure water introduction valve to the above-mentioned treating solution supply route, and an effluent way which derives an effluent overflowed from the above-mentioned substrate treatment tub to an effluent drain, While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in HF processing. Supply HF in a treating solution storage container to a substrate treatment tub, and it is made to overflow from a treating solution supply route, In pure water processing which collects from the above-mentioned effluent way to the treating solution storage container concerned via a treating solution recovering valve, and is performed after the above-mentioned HF processing. Supply pure water to a substrate treatment tub, make it overflow from a purified water supply route, discard from the above-mentioned effluent way to an effluent drain via an effluent valve, and shift to pure water processing from the above-mentioned HF processing is faced, By suspending supply of HF, then making the above-mentioned substrate treatment tub supply and overflow pure water in the state of HF ON ****, HF in the above-mentioned substrate treatment tub is transposed to pure water.

[0012]And in a dipping processor of the substrate according to claim 1 or 2, while an invention of claim 3 attaches a filter between a feeding pump of said treating solution supply route, and said treating solution introduction valve, Rather than a treating solution introduction valve, open a purified water supply route for free passage to the downstream, connect between a feeding pump of the above-mentioned treating solution supply route, and a purified water supply route terminal area, and a treating solution recovery passage in pure water processing. A treating solution pumped up with a feeding pump is circulated to a treating solution recovery passage, and the above-mentioned treating solution storage container is refluxed.

[0013]

[Function]In the invention of claim 1, since the purified water supply route was opened for free passage via the pure water introduction valve to the treating solution supply route to the substrate treatment tub, sequential execution of a chemical treatment and the pure water processing will be carried out by one substrate treatment tub. While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in a chemical treatment. From a treating solution supply route, the treating solution in a treating solution storage container is supplied to a substrate treatment tub, and overflows, and it is

collected from the above-mentioned effluent way by the treating solution storage container concerned via a treating solution recovering valve, and flows back to a substrate treatment tub again. That is, a treating solution is reused, without being discarded. On the other hand, in the pure water processing performed after the above-mentioned chemical treatment, from a purified water supply route, pure water is supplied to a substrate treatment tub, is overflowed, and is discarded by the effluent drain via an effluent valve from the above-mentioned effluent way. And on the occasion of the shift to the pure water processing from the above-mentioned chemical treatment, supply of a treating solution is suspended and the treating solution in the above-mentioned substrate treatment tub is transposed to pure water by supplying pure water and overflowing succeedingly, where a treating solution is put into the above-mentioned substrate treatment tub. That is, within a substrate treatment tub, a substrate shifts to pure water processing from a chemical treatment, without touching air.

[0014]Also in the invention of claim 2, since the purified water supply route was opened for free passage via the pure water introduction valve to the treating solution supply route to the substrate treatment tub, sequential execution of a chemical treatment and the pure water processing is carried out by one substrate treatment tub. While it branches and one side is open for free passage to an effluent drain via an effluent valve, another side is open for free passage to the above-mentioned treating solution storage container via a treating solution recovering valve as a treating solution recovery passage, and the above-mentioned effluent way in HF processing. From a treating solution supply route, HF in a treating solution storage container is supplied to a substrate treatment tub, and overflows, it is collected from the above-mentioned effluent way by the treating solution storage container concerned via a treating solution recovering valve, and HF is reused, without being discarded. On the other hand, in the pure water processing performed after the above-mentioned HF processing, from a purified water supply route, pure water is supplied to a substrate treatment tub, and overflows, and it is discarded by the effluent drain via an effluent valve from the above-mentioned effluent way. And on the occasion of the shift to the pure water processing from the above-mentioned HF processing, supply of HF is suspended, and succeedingly, when pure water carries out supply ****** overflow in the state of HF ON **** at the above-mentioned substrate treatment tub, HF in the above-mentioned substrate treatment tub is transposed to pure water. That is, within a substrate treatment tub, a substrate shifts to pure water processing from HF processing, without touching air.

[0015]In the invention of claim 3, in the dipping processor of the substrate according to claim 1 or 2, while attaching a filter between the feeding pump of said treating solution supply route, and said treating solution introduction valve, A chemical treatment since the purified water supply route was opened for free passage to the downstream and the treating solution recovery passage was connected rather than the treating solution introduction valve between the feeding pump of the above-mentioned treating solution supply route, and the purified water supply route terminal area (HF processing is included.) While pure water processing is performed like the following, it is a treating solution (HF is included.). the following -- being the same -- it refreshes by filtering (only henceforth "filtering"). When pure water processing is performed, the treating solution pumped up with the feeding pump flows down a treating solution recovery passage, after being filtered, and flows back to a treating solution storage container again.

[0016]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described based on a drawing. The substrate processing device for substrate washing with which this invention is applied first is explained. As for the outline perspective view of a substrate processing device, and drawing 17, the outline top view of the device and drawing 18 of drawing 16 are outline drawings of longitudinal section of the device. While this substrate processing device 50 installs two or more substrate treatment tubs 1 side by side in the dipping treatment part 65 mentioned later and performs washing processing of a semiconductor wafer (only henceforth a wafer), The penetrant removers (only henceforth a treating solution) overflowed from the substrate treatment tub 1 are collected to the treating solution storage container 6, and the recycling of them is enabled.

[0017]As shown in drawing 16 - drawing 18, this substrate processing device 50, The carrying in/out part 51 of the substrate accommodation cassette C, and the substrate transfer part 60 which loads the wafer W with the wafer W into extraction or the cassette C from the cassette C, The cassette transfer robot 55 which transfers the cassette C between the carrying in/out part 51 of the cassette C, and the substrate transfer part 60, It comprises the dipping treatment part 65 which washes two or more wafers W collectively, the liquid end board dryer part 70 of the wafer W, and the substrate transfer robot 75 which does package maintenance and conveys two or more wafers W picked out from the cassette C in the substrate transfer part 60 to the above-mentioned dipping treatment part 65 and the substrate dryer part 70.
[0018]As shown in drawing 16 - drawing 18, rise and fall and rotation are free for the above-mentioned cassette transfer robot 55, It is constituted so that the cassette C which was constituted movable in the direction of arrow A, and transferred the cassette C carried in to the carrying in/out part 51 on the table 61 of the substrate transfer part 60, and accommodated the washed wafer W may be transferred to the carrying in/out part 51 from the table 61 concerned. As the above-mentioned substrate transfer robot 75 shows drawing 16 - drawing 18, It is provided in the direction of arrow B movable, and two or more wafers W received from the lifter 64 of the above-mentioned substrate transfer part 60 are held by the substrate transfer robot's 75 substrate pinch arm 76, and it is constituted so that it may convey one by one into the dipping treatment part 65 and the substrate dryer part 70 along with the moving section 77.
[0019]Various kinds of dipping processors concerning this invention are allocated in the above-mentioned dipping treatment part 65 so that it may state below. However, in drawing 16 - drawing 18, what installed the three substrate treatment tubs 1 side by side is illustrated. Namely, in two or more wafers W received from said substrate transfer robot 75, in each substrate treatment tub 1, one by one, the above-mentioned dipping treatment part 65 is constituted by the board holder 66 which installed the three overflowed type substrate treatment tubs 1 side by side, and was formed in each substrate treatment tub 1 so that rise and fall were possible so that immersion is possible. The concrete contents of the dipping processor concerning the embodiment of this invention are mentioned later.
[0020]The above-mentioned substrate dryer part 70 possesses the drying process tub 71 which carries out liquid end desiccation by rotary centrifugal force by making the neighborhood of a center of the principal plane of the wafer W into a center of rotation, as indicated to JP,1-255227,A which starts these people's proposal, for example. This substrate dryer part 70 is changed to the thing of the centrifugal type concerned, and even if it promotes desiccation with heating steam or the dry method by decompression in addition to the dry method which uses an organic solvent etc., or this, it does not interfere.
[0021]As a layout of the above-mentioned substrate processing device 50, as shown in drawing 16 - drawing 18, the carrying in/out part 51, the substrate transfer part 60, the substrate dryer part 70, and the dipping treatment part 65 of said cassette C are arranged in order toward the back facing the work area 31 for preservation from the front facing the clean room work area 30. As shown in drawing 16 and drawing 18, the piping chamber 20 for feeding and discarding of a treating solution is arranged in the lower part of the three substrate treatment tubs 1 of the above-mentioned dipping treatment part 65, and the treating solution storage container 6 for washing is arranged at three steps of upper and lower sides in the lower part of this piping chamber 20 for feeding and discarding. As shown in drawing 16 and drawing 17, the substrate transfer robot's 75 moving section 77 is formed in the right-hand side of above-mentioned substrate transfer part 60, substrate dryer-part 70, and dipping treatment part 65 at a cross direction, and back space is formed as the maintenance space 90 rather than said substrate transfer part 60 in the space of such left-hand side. Two or more piping, a valve, etc. are constructed by the floor of the maintenance space 90.
[0022]That is, in the above-mentioned substrate processing device 50, since the substrate treatment tub 1, the piping chamber 20 for feeding and discarding, and the treating solution storage container 6 of the dipping treatment part 65 are accumulated on three steps of upper and lower sides and it arranges to a lengthwise direction, the maintenance space 90 is securable for these area that was accumulated and faced the left-hand side of the part. If it puts in

another way, as shown in drawing 17, the excessive space in the substrate processing device 50 can be set up as the maintenance space 90 by packing the various work block of the dipping treatment part 65, the substrate transfer part 60, etc. in the shape of an L character by plane view. In summarizing the substrate processing device 50 whole compactly, and being able to attain space-saving-ization of the whole clean room efficiently by mainly accumulating the dipping treatment part 65 on longitude, The effective use rate of the space in a clean room is further raised, so that the installed number of the substrate processing device 50 concerned increases.

[0023]In the layout of the substrate treatment tub 1 of the above-mentioned dipping treatment part 65, and the substrate dryer part 70. As shown in drawing 16 - drawing 18, three overflowed type the substrate treatment tubs 1, and the drying treatment parts 70 and said substrate transfer parts 60 are arranged in order toward the front side which attends the clean room work area 30 from the back side facing the work area 31 for preservation. That is, since the above-mentioned substrate dryer part 70 is arranged between the dipping treatment part 65 and the substrate transfer part 60, it dries the wafer W by which washing processing was carried out as quickly as possible, is returned to the cassette C, and can be efficiently taken out from the carrying in/out part 51. On the other hand, since this substrate drying process does not receive strongly the temporal restriction to return to the cassette C but standby time can be taken between the return in the substrate transfer part 60 from completion of a drying process, the drying treatment part 70 can be made to bear the role like a buffer to the adjoining substrate transfer part 60 in respect of a process of operation.

[0024]Since the acid which carried out temperature up in acid cleaning processing is usually used, are easy to generate the steam and mist of acid, but. For example, when carrying out this acid cleaning processing by the substrate treatment tub 1 by the side of the most distant back from the clean room work area 30, the adverse effect to the clean room work area 30 is prevented, and the safety of work can be secured. Hereafter, the embodiment of the various dipping processors allocated in the above-mentioned dipping treatment part 65 is described one by one.

[0025]Drawing 1 is an outline distribution diagram of the dipping processor concerning Embodiment 1 of this invention. The three substrate treatment tubs 1, 1, and 1 which immerse two or more substrates W collectively into a treating solution, and make the surface washing of the substrate W as this dipping processor is shown in drawing 1, The treating solution storage container 6 which passed the treating solution introduction valve 8 and the feeding pump 15 to the treating solution supply route 7 which supplies a treating solution, and the treating solution supply route 7 in order, and was open for free passage from the lower part of each substrate treatment tub 1, The purified water supply route 3 which was open for free passage via the pure water introduction valve 27 to the treating solution supply route 7, and the effluent way 42 which derives the effluent overflowed from the substrate treatment tub 1 to the effluent drain 43 are provided. That is, in each substrate treatment tub 1, the chemical treatment later mentioned by predetermined treating solution Q_A - Q_C, respectively is performed independently.

[0026]The above-mentioned substrate treatment tub 1 is formed in side-view substantially v-shaped and plain-view substantially rectangle-shaped one by the product made from silica glass, as shown in drawing 1, While connecting the treating solution supply route 7 with the lower part, forming the uniform upflow of a treating solution in the substrate treatment tub 1 and carrying out the surface treatment of the substrate W, it is constituted as an overflow tub which can replace a treating solution promptly for two or more sorts of every washing processings. Not only the product made from silica glass but when, using for a penetrant remover HF etc. which make silica glass corrode for example, what was formed at charges of resin lumber, such as tetrafluoroethylene resin which has corrosion resistance, may be sufficient as the substrate treatment tub 1 concerned. It does not interfere, even if it installs the four or more overflowed type substrate treatment tubs 1 in the dipping treatment part 65 side by side.

[0027]The treating solution supply route 7 connected with the lower part of each substrate treatment tub 1 in the shape of parallel as the composition for supplying a treating solution was

shown in drawing 1, The treating solution storage container 6 connected with the treating solution supply route 7 via the treating solution introduction valve 8 and the feeding pump 15, and the purified water supply route 3 and pure water supply source (graphic display abbreviation) which were open for free passage via the pure water introduction valve 27 to the above-mentioned treating solution supply route 7 are provided. Although the above-mentioned purified water supply route 3 turns into a main aisle of the pure water which is ordinary temperature or supplies pure water D_W heated to prescribed temperature, when pure water D_W prevents scaling of a substrate, it is preferred to use what performed deoxidation treatment.

[0028]If the above-mentioned treating solution introduction valve 8 is opened, the treating solution in the treating solution storage container 6 will be fed by the substrate treatment tub 1 with the feeding pump 15, and will be overflowed from the substrate treatment tub 1, and a chemical treatment will be performed. If the above-mentioned pure water introduction valve 27 is opened, from the purified water supply route 3, pure water D_W will be supplied to the substrate treatment tub 1, will overflow, and pure water processing will be performed. Namely, selectively, the treating solution supply route 7 constitutes treating solution Q_A - Q_C, and pure water D_W from switching operation of the treating solution introduction valve 8 and the pure water introduction valve 27 so that supply is possible. Automatically, treating solution Q_A - Q_C are constituted by the above-mentioned treating solution storage container 6 so that a supplement is possible.

[0029]The composition for discharging treating solution Q_A - Q_C, As shown in drawing 1, the overflow liquid stripping section 41 attached to the upper section of each substrate treatment tub 1, the effluent way 42 which discharges the overflowing treating solution, and the communicating path 4 drawn from the pars basilaris ossis occipitalis of the substrate treatment tub 1 via the feeding-and-discarding change-over valve 13 on the effluent way 42 concerned are provided. the circulation lower part side of the above-mentioned effluent way 42 -- two forks -- it branches to **, one of these is connected to the effluent drain 43 via the effluent valve 47, and it connects with said treating solution storage container 6 via the treating solution recovering valve 44 by making the another side into the treating solution recovery passage 22. The above-mentioned feeding-and-discarding change-over valve 13 is for deriving each treating solution Q_A in the substrate treatment tub 1 - Q_C to the effluent way 42 if needed.

[0030]According to this Embodiment 1, as shown in drawing 1, the treating solution supply route 7 drawn from each treating solution storage container 6 is connected to the lower part of each substrate treatment tub 1 via the treating solution introduction valve 8.

Predetermined treating solution Q_A - Q_C are supplied to each substrate treatment tub 1 from each treating solution storage container 6, respectively.

The purified water supply route 3 is connected to the lower part of each substrate treatment tub 1 via the pure water introduction valve 27, and supply of pure water D_W is attained respectively at each substrate treatment tub 1. And the downstream of the effluent way 42 drawn from the upper part of the substrate treatment tub 1 has branched to the 2-way by the side of the effluent drain 43 opened for free passage via the effluent valve 47 the treating solution storage container 6 side opened for free passage via the treating solution recovering valve 44. For this reason, when treating solution Q_A of drawing 1 is described, treating solution Q_A in the treating solution storage container 6, After overflowing from the treating solution supply route 7 to each substrate treatment tub 1 and washing the wafer W, it is collected from the effluent way 42 by the treating solution storage container 6 via the treating solution recovering valve 44, and is recycled by the substrate treatment tub 1.

[0031]On the other hand, in the pure water processing performed after a chemical treatment, from the purified water supply route 3, pure water D_W is supplied to the substrate treatment tub 1, is overflowed, and is discarded by the effluent drain 43 via the effluent valve 47 from the effluent way 42. It is similarly constituted from the substrate treatment tub 1 by treating solution

Q_B and Q_C callable. Therefore, since each treating solution Q_A overflowed from the substrate treatment tub 1 - Q_C are collected and reused by the treating solution storage container 6 via the treating solution recovering valve 44, Compared with the conventional example 2 which discards a treating solution for two or more sorts of every chemical treatments, the amount of consumption of a treating solution is controlled effectively, and the running cost of the whole substrate processing device can be reduced.

[0032]In this dipping processor, since the wafer W is immersed in the three substrate treatment tubs 1 installed side by side one by one and parallel processing is carried out by two or more sorts of treating solution Q_A - Q_C as shown in drawing 1, a throughput improves. And since a treating solution is made to overflow from the upper part of the substrate treatment tub 1 in this dipping processor, when shifting to pure water processing from a chemical treatment. It is possible not to all discharge the penetrant remover in the substrate treatment tub 1, but for ** to also replace a drug solution by pure water, and the wafer W cannot touch air until a chemical treatment and pure water processing are completed. For this reason, there is no possibility that an oxide film may be formed in a wafer surface, or the impurity in the air may adhere. The penetrant remover in the substrate treatment tub 1 all is not discharged, but ** can also perform charge and extraction of the wafer W.

[0033]Next, an example is given and explained about the contents of the chemical treatment in the above-mentioned Embodiment 1. SC_1 processing is performed in the 1st substrate treatment tub 1. As treating solution Q_A, the mixed liquor of ammonia (NH_4 OH), the hydrogen peroxide solution (H_2O_2), and pure water D_W which were prepared is used. Pure water processing is carried out after the chemical treatment by treating solution Q_A, and organic matters, such as photoresist adhering to the surface of the wafer W, are removed. It may replace with SC_1 processing and CARO processing may be performed. Sulfuric peroxide mixture is used as treating solution Q_A in this case.

[0034]SC_2 processing is performed in the 2nd substrate treatment tub 1. As treating solution Q_B, the mixed liquor of the chloride (HCl), hydrogen peroxide solution (H_2O_2), and pure water which were prepared is used. Pure water processing is similarly carried out after the chemical treatment by treating solution Q_B, and the metal ion adhering to the surface of the wafer W is removed. HF processing is performed in the 3rd substrate treatment tub 1. The 50% solution of hydrogen fluoride is used as treating solution Q_C, and the unexposed portion of the surface of the wafer W, etc. are etched. It may replace with the above-mentioned hydrogen fluoride, and a phosphoric acid filtered water may be used.

[0035]According to the manufacturing process, a surface treatment including washing processing of a wafer is not necessarily immersed in the 1st - the 3rd substrate treatment tub 1 one by one rather than is uniform. Incidentally, various surface treatments like for example, following the (1) - (4) as the type are possible.

(1) SC_1 processing ->HF processing ->SC_2 processing (2) HF processing ->SC_1 processing ->SC_2 processing (3) SC_1 processing -> -- SC_2 processing (4) -- in addition to this -- HF processing or SC_1 processing.

In the embodiment mentioned later, the type of the above-mentioned chemical treatment is applicable similarly.

The overlapping explanation is omitted.

[0036]If the wafer W is contacted to air after carrying out HF processing when HF processing is included in one of chemical treatments, HF, and O_2 and Si will react, an impure compound will arise on the surface of the wafer W, and it will become particle. For this reason, after supplying HF to the substrate treatment tub 1 and circulating through it, HF is transposed to pure water

by making pure water supply and overflow, where it suspended supply of HF, then HF is put into the substrate treatment tub 1. Thereby, the wafer W always remains in liquid, and it is removed, without an HF component generating particle by the continuous supply of pure water.
[0037]The resistivity of pure water is detected, or last rinsing treatment by the above-mentioned pure water is consisted of by progress of fixed time so that pure water processing may be completed. In pulling up the wafer W from the substrate treatment tub 1 after the last rinse is completed, in order to prevent the particle which floated from adhering to the wafer W, it carries out making pure water overflow.
[0038]The point that the number of the substrate treatment tub 1 is reduced and enlargement of a substrate processing device can be prevented by carrying out a chemical treatment and pure water processing as an advantage in the above-mentioned Embodiment 1 using the single substrate treatment tub 1, The point that a running cost can be reduced by collecting and reusing each treating solution Q_A – Q_C to the treating solution storage container 6, Although the point that an oxide film can be prevented from being formed in a wafer surface by replacing a treating solution by pure water without all discharging the treating solution in the substrate treatment tub 1, when shifting to pure water processing from a chemical treatment is mentioned, Also in Embodiment 2 mentioned later – Embodiment 11, these advantages are the same, and the overlapping explanation is omitted.
[0039]Drawing 2 is an outline distribution diagram of the dipping processor concerning Embodiment 2 of this invention. This dipping processor sets one of the three substrate treatment tubs 1 allocated in said dipping treatment part 65 as the substrate treatment tub only for pure water processing, as shown in drawing 2. Namely, while drawing the purified water supply route 3 from the lower part of the tub 1 only for rinse and connecting a pure water supply source (not shown) to the purified water supply route 3 via the pure water introduction valve 27, While draw the effluent way 42 from the upper part of the tub 1 only for rinse, and the effluent drain 43 is connected to the effluent way 42 via the effluent valve 47, and pure water D_W is supplied to the tub 1 only for rinse, overflows and carrying out pure water processing of the wafer W, It is constituted so that it may be discarded by the effluent drain 43 via the effluent valve 47 from the effluent way 42.
[0040]In this Embodiment 2, after the chemical treatment by treating solution Q_A or Q_B is performed by each of the two substrate cleaning tanks 1, pure water processing is performed lightly succeedingly, but pure water processing by pure water D_W is performed by the above-mentioned tub 1 only for rinse still more nearly separately. For this reason, compared with the case where a chemical treatment and pure water processing are performed by each substrate treatment tub 1 like Embodiment 1, the wafer W can be rinsed powerfully, the time required of pure water processing is shortened, and a throughput improves.
[0041]Drawing 3 is an outline distribution diagram of the dipping processor concerning Embodiment 3 of this invention. This dipping processor is what allocated the substrate treatment tub 1 of the single tub in the dipping treatment part 65 of the substrate cleaning device 50, While collecting the treating solutions which the substrate treatment tub 1 is supplied and are overflowed like said Embodiment 1 or Embodiment 2 to the treating solution storage container 6 via the treating solution recovery passage 22 and the treating solution recovering valve 44 and constituting them so that reuse is possible, It constitutes so that pure water D_W overflowed from the substrate treatment tub 1 may be discarded to the effluent drain 43. Also in this Embodiment 3, while controlling the amount of consumption of a treating solution, the substrate processing device 50 whole can be compactly summarized by single tub-ization of the substrate treatment tub 1.
[0042]Drawing 4 is an outline distribution diagram of the dipping processor concerning Embodiment 4 of this invention. This Embodiment 4 connects two or more treating solution storage containers 6 so that a change is possible. Although the point whose reuse this dipping processor made the treating solution storage container 6 circulate through a treating solution from the substrate treatment tub 1, and was enabled is the same as that of said Embodiments

1-3, As this Embodiment 4 performs three kinds of chemical treatments in order within the one substrate treatment tub 1 to said Embodiment 1 performing three kinds of chemical treatments independently by the three substrate treatment tubs 1, the feature is that it carried out common use of the substrate treatment tub 1 to two or more sorts of chemical treatments.

[0043]That is, as shown in drawing 4 (A), the treating solution supply route 7 is connected with the lower part of the one substrate treatment tub 1 via each treating solution introduction valve 8_A, 8_B, and 8_C from each treating solution storage container 6 of three kinds of treating solution Q_A, Q_B, and Q_C. Here, above-mentioned treating solution introduction valve 8_A, 8_B, and 8_C are also the treating solution selective valves 82. Drawing 4 (B) shows the introduction valve connection way 16 where **, treating solution introduction valve 8_A, 8_B and 8_C which carry out **, and the pure water introduction valves 27 gathered each treating solution in the supply side of this treating solution, The purified water supply route 3 is connected to the one end 16a of the connection way 16 concerned, and the treating solution supply route 7 is connected to the other end 16b.

[0044]Branch the downstream of the effluent way 42 of the above-mentioned substrate treatment tub 1 to four, respectively, and these one side is connected to the effluent drain 43, Another side is connected to the treating solution storage container 6 of the three above-mentioned kinds of treating solution Q_A, Q_B, and Q_C as the treating solution recovery passage 22 (specifically 22a, 22b, 22c). While collecting various kinds of overflowing treating solutions to the treating solution storage container 6, it constitutes so that it can discard to the effluent drain 43 if needed. Drawing 4 (C) shows the important section of the effluent way 42 where **, treating solution recovering valve 44_A, 44_B and 44_C which carry out **, and the effluent valves 47 gathered each treating solution to the discharge side of this treating solution, and the above-mentioned effluent valve 47 for pure water is formed in the innermost part 42a of the downstream of the effluent way 42. Here, above-mentioned treating solution recovering valve 44_A, 44_B, and 44_C are also treating solution ******** 83.

[0045]On the other hand, the feeding means 25 of each treating solution Q_A to the above-mentioned substrate treatment tub 1 - Q_C, The one feeding pump 15 formed in the treating solution supply route 7 (specifically 7_A - 7_C) drawn from each treating solution storage container 6 (specifically 6_A - 6_C) as shown in drawing 4 (A), It comprises the motor 19 which drives the feeding pump 15, the pressure sensor 26 (specifically pressure gauge) formed in the discharge side of the feeding pump 15, and the control means 12 which carries out increase and decrease of the number of rotations of the feeding pump 15 of control based on the detecting signal from the pressure sensor 26. In the feeding means 25 concerned, the pressure sensor 26 detects the excess and deficiency to setting pressure, the control means 12 concerned carries out drive controlling of the drive motor 19 of the feeding pump 15, and a treating solution is fed by the substrate treatment tub 1 with a predetermined setting pressure.

[0046]In washing the wafer W, it carries out the chemical treatment of the wafer W, making the substrate treatment tub 1 circulate through treating solution Q_A via treating solution introduction valve 8_A, and making it overflow first. Treating solution Q_A is succeedingly collected to the treating solution storage container 6 via treating solution recovering valve 44_A of the feeding-and-discarding liquid change-over valve 13 and the effluent way 42 after that. And pure water D_W is supplied to the substrate treatment tub 1 which became empty via the pure water introduction valve 27, and it shifts to pure water processing. Pure water is discharged after rinsing the wafer W, making pure water overflow. After making it circulate like the case of treating solution Q_A and carrying out a chemical treatment also with treating solution Q_B and Q_C, the wafer W is pulled up from the substrate treatment tub 1.

[0047]In the above-mentioned pure water processing, the pure water effluent overflowed from

the substrate treatment tub 1 is discarded to the effluent drain 43 via the effluent valve 47. Since pure water waste fluid is discharged from the innermost part 42a of the effluent way 42 in that case, the treating solution which remains to the wall of the effluent way 42 is flushed effectively. The outlet 45 and the feeding-and-discarding liquid change-over valve 13 of a pars basilaris ossis occipitalis of the substrate treatment tub 1 are constituted so that a quick drain is possible, and they are raising the throughput by rapid discharge. When HF processing is included in one of chemical treatments, In pulling up the substrate W from the substrate treatment tub 1 after the last rinse is completed while replacing HF by pure water by making the substrate treatment tub 1 supply and overflow pure water as mentioned above where HF is put in, it carries out making pure water overflow.

[0048]Drawing 5 shows the outline distribution diagram of the dipping processor concerning Embodiment 5 of this invention, the thick line in the figure (A) shows the treating solution course in the case of a chemical treatment, and the thick line in the figure (B) shows the pure water path and treating solution course of a case of pure water processing. This dipping processor is for performing circulation filtering and the temperature control of a treating solution, while allocating the single substrate treatment tub 1 in said dipping treatment part 65, and a chemical treatment and pure water processing are performed. That is, as shown in drawing 5 (A) and (B), the treating solution introduction valve 8 of the treating solution supply route 7 and the effluent valve 47 of the effluent way 42 consist of respectively switchable cross valves.

[0049]the circulation lower part side of the above-mentioned effluent way 42 -- two forks -- it branches to **, one pipeline 21 is connected to the effluent drain 43, and it connects with the treating solution storage container 6 by making another side into the treating solution recovery passage 22. And while opening the purified water supply route 3 for free passage to the downstream rather than the treating solution introduction valve 8, The filter 10 and the heater (henceforth "an in-line heater") 81 of an inline type are attached between the feeding pump 15 and the treating solution introduction valve 8, and the treating solution supply route 7 and the treating solution recovery passage 22 are connected via the switchable treating solution introduction valve 8.

[0050]When a chemical treatment is performed, as shown in drawing 5 (A), the penetrant remover overflowed from the substrate treatment tub 1 to the overflow liquid stripping section 41, It is collected by the treating solution storage container 6 through the treating solution recovery passage 22, and is again sucked up with the feeding pump 15, and after being filtered with the filter 10 and refreshing, it flows back to the substrate treatment tub 1. When pure water processing is performed, as shown in drawing 5 (B), overflowing pure water is discharged by the effluent drain 43 via the switchable effluent valve 47 and the effluent way 21.

[0051]After filtering the treating solution pumped up with the feeding pump 15 during this pure water processing with the filter 10 and refreshing it, it flows into the treating solution recovery passage 22 via the switchable treating solution introduction valve 8, and flows back to the treating solution storage container 6 again. Even when using the single substrate treatment tub 1 by the above-mentioned composition, while a chemical treatment and pure water processing are performed, circulation filtering of a treating solution is performed, and a treating solution can be made to refresh. Said in-line heater 81 possesses the composition which allocated the heater in the periphery of a pipeline, for example, and heats the treating solution which passes a pipeline. For this reason, when the treating solution through which it circulates during the pure water processing mentioned above can be adjusted to a uniform temperature and it performs especially an elevated-temperature chemical treatment, it becomes possible to supply the treating solution of prescribed temperature in a substrate treatment tub, and to shift to washing processing promptly.

[0052]Drawing 6 shows the outline distribution diagram of the dipping processor concerning Embodiment 6 of this invention, the thick line in the figure (A) shows the treating solution circulating route in the case of a chemical treatment, and the thick line in the figure (B) shows the pure water path and treating solution circulating route of a case of pure water processing. Circulation filtering and the temperature control of a treating solution are performed like [this dipping processor] Embodiment 5 (drawing 5). That is, in the dipping processor of Embodiment 5

(drawing 5), as shown in drawing 6 (A) and (B), while attaching the switchable treating solution recovering valve 44 to the above-mentioned treating solution recovery passage 22, the feeding pump upstream and the treating solution recovery passage 22 of the treating solution supply route 7 are connected via the above-mentioned treating solution recovering valve 44.

[0053]When a chemical treatment is performed, as shown in drawing 6 (A), from the overflow liquid stripping section 41 of the substrate treatment tub 1. A treating solution flows down the treating solution recovery passage 22 via the effluent valve 47, flows into the treating solution supply route 7 via the above-mentioned treating solution recovering valve 44 without the treating solution storage container 6, and while being filtered with the filter 10 and refreshing, after a temperature control is carried out, it flows back to the substrate treatment tub 1 again. On the other hand, when pure water processing is performed, as shown in drawing 6 (B), while refreshing the treating solution pumped up with the feeding pump 15 with the filter 10, after the temperature control of it is carried out, it flows down the treating solution recovery passage 22, and flows back to the treating solution storage container 6 via the above-mentioned treating solution recovering valve 44.

[0054]in the above-mentioned Embodiment 6, since a treating solution will be attracted with the feeding pump 15 and it will flow down the treating solution recovery passage 22 when a chemical treatment is performed, even if the tube diameter of the treating solution recovery passage 22 is thin, the flow of the treating solution which flows down as compared with Embodiment 5 which only flows down by a fall is boiled markedly, and increases. That is, there is an advantage that the tube diameter of the treating solution recovery passage 22 has been thin enough.

[0055]Drawing 7 shows the outline distribution diagram of the dipping processor concerning Embodiment 7 of this invention. This Embodiment 7 installs 3 sets of the same dipping processors as Embodiment 6 (drawing 6) side by side, and constitutes them. In this Embodiment 7, as shown in drawing 7, in each substrate treatment tub 1, the chemical treatment of said type is independently performed by predetermined treating solution Q_A – Q_C, respectively, Each treating solution Q_A which carried out the surface treatment of the wafer W – Q_C are collected and reused by each treating solution storage container 6. Each treating solution Q_A – Q_C can be made to refresh by circulation filtering, and the in-line heater 81 can also perform the temperature control of each treating solution Q_A – Q_C.

[0056]Drawing 8 shows the outline distribution diagram of the dipping processor concerning Embodiment 8 of this invention. In [this dipping processor sets one tub in the substrate treatment tub 1 as the tub only for rinse for pure water processing in Embodiment 7 (drawing 7), and] other 2 sets, While a chemical treatment and pure water processing are performed, the point of performing circulation filtering and the temperature control of a treating solution is the same as that of Embodiment 6 (drawing 6). At this Embodiment 8, after the chemical treatment by treating solution Q_A or Q_B is performed by each of the two substrate treatment tubs 1, pure water processing is performed lightly succeedingly and pure water processing by pure water D_W is further performed by the tub 1 only for rinse. By this, the wafer W can be rinsed powerfully, the time required of pure water processing is shortened compared with the case where a chemical treatment and pure water processing are performed one by one by each substrate treatment tub 1, and a throughput improves.

[0057]Drawing 9 and drawing 10 show the outline distribution diagram of the dipping processor concerning Embodiment 9 of this invention, the thick line in drawing 9 shows the treating solution circulating route in the case of a chemical treatment, and the thick line in drawing 10 shows the pure water path and treating solution circulating route of a case of pure water processing. This Embodiment 9 is a point using the single substrate treatment tub 1, and while a chemical treatment and pure water processing are performed, it is common in Embodiment 6 (drawing 6) in that circulation filtering and the temperature control of a treating solution are performed.

[0058]According to this Embodiment 9, at the time of treating solution recovery, it serves also as the treating solution recovery passage 22 between the opening and closing valve 9 of that pump upstream, and the treating solution introduction valve 8 among the treating solution supply

routes 7 in drawing 9 and drawing 10. In drawing 9, when a chemical treatment is performed, the above-mentioned opening and closing valve 9 of the treating solution supply route 7, the treating solution introduction valve 8, and the effluent valve 47a that can switch the effluent way 42 are opened, and other valves are closed. The treating solution Q is pumped up from the feeding pump 15 until it is filled in the substrate treatment tub 1 and it fully overflows it.

[0059]The opening and closing valve 9 of the pump upstream of the aftertreatment solution supply route 7 is stopped. The treating solution Q overflowed from the substrate treatment tub 1. It flows down the treating solution recovery passage 22 via the effluent way 42 and the effluent valve 47a from the overflow collection part 41, It flows into the pump upstream of the treating solution supply route 7 without passing the treating solution storage container 6, it is again pumped up with the feeding pump 15, and after being filtered with the filter 10 and refreshing, it flows back to the substrate treatment tub 1. That is, while the chemical treatment of a substrate is performed, circulation filtering of a treating solution is performed.

[0060]After a chemical treatment is completed, the above-mentioned opening and closing valve 9 and the treating solution introduction valve 8 of the treating solution supply route 7 are closed, and the feeding-and-discarding liquid change-over valve 13 which opens the effluent valve 47a and the treating solution supply route 7, and the treating solution recovery passage 22 of the effluent way 42 for free passage is opened. The treating solution recovery passage 22a of the latter part drawn between the feeding pump 15 and the treating solution introduction valve 8 is opened for free passage by the treating solution storage container 6 via the treating solution recovering valve 44, and other valves are closed. And the treating solutions Q in the substrate treatment tub 1 are collected in the treating solution storage container 6 through the treating solution recovery passage 22a-> treating solution recovering valve 44 of the upstream -> feeding pump 15 -> latter part of the treating solution recovery passage 22 -> treating solution supply route 7.

[0061]In drawing 10, when finishing recovery of a treating solution and shifting to pure water processing, the above-mentioned opening and closing valve 9 is opened, the feeding-and-discarding liquid change-over valve 13 is closed, and the effluent valve 47a of the effluent way 42 is switched to the effluent drain 43a side. The treating solution Q collected in the treating solution storage container 6 is pumped up with the feeding pump 15, and circulation filtering is performed via the filter 10 -> above-mentioned treating solution recovery passage 22a-> treating solution recovering valve 44.

[0062]Subsequently, the feeding-and-discarding liquid change-over valve 13 is closed, the 1st effluent valve 47a of the effluent way 42 is switched to the drain 43a side for wastewater, and the pure water introduction valve 27 of the purified water supply route 3a is opened. It rinses a wafer, pure water D_W being filled in the substrate treatment tub 1, and overflowing it. pure water D_W overflowed from the substrate treatment tub 1 -- the [overflow collection part 41 -> effluent way 42 ->] -- the [of one / effluent valve 47a->] -- pass the effluent way 21a for effluent valve 47b-> wastewater of two -- it is discharged by the drain 43a for wastewater. And circulation filtering of a treating solution is performed also between pure water processings of a wafer.

[0063]This Embodiment 9 is provided with the following abundant functions other than circulation filtering mentioned above. As shown in drawing 9 and drawing 10, the above-mentioned substrate treatment tub 1 is installed in the ultrasonic-cleaning-parts 34 upper part in the effluent tub 2, can wash a wafer powerfully via the ultrasonic cleaning parts 34 with the ultrasonic wave oscillator 35, and can be carried out (henceforth an ultrasonic-cleaning function). The above-mentioned purified water supply route 3 branches to the shower introducing path 3b connected to the pure water introducing path 3a connected to the treating solution supply route 7, and the shower pipe 17, the unit valve 27 which constitutes a pure water introduction valve is attached to the pure water introducing path 3a, and the same unit valve 28 is attached to the shower introducing path 3b. This pure water shower is used, when pure water washes a wafer lightly before carrying out a chemical treatment (henceforth a pure water shower function). Separation discharge of the pure water of the surplus from the unit valves 27 and 28 is carried out in the

drain 43b for pure water recovery mentioned later.
[0064]The above-mentioned effluent way 42 branches to the drainage ditch 21 and the treating solution recovery passage 22 via the switchable 1st effluent valve 47a. The above-mentioned drainage ditch 21 branches via the 2nd effluent valve 47b on the effluent way 21a for wastewater, and the effluent way 21b for recovery. The effluent way 21a for wastewater is connected to the drain 43a for wastewater, and the effluent way 21b for recovery is connected to the drain 43b for pure water recovery. When the quick drain valve 32 for rapid wastewater is attached to the above-mentioned substrate treatment tub 1 and a pure water effluent is discharged from the substrate treatment tub 1, Open the quick drain valve 32, it is made to flow down a pure water effluent in the effluent tub 2, switching operation of the 1st effluent valve 47a and the 2nd effluent valve 47b is carried out suitably, and the drain 43a for wastewater or the drain 43b for pure water recovery is made to carry out separation discharge (henceforth the separation excretory function of wastewater).
[0065]Between the terminal area of the pure water introducing path 3a, and the treating solution introduction valve 8, the above-mentioned treating solution supply route 7 is opened for free passage by the treating solution recovery passage 22 via the feeding-and-discarding change-over valve 13, and the lower end of the treating solution recovery passage 22 is opened for free passage between the opening and closing valve 9 and the feeding pump 15 which were attached to the treating solution supply route 7. The latter treating solution recovery passage 22a and the treating solution effluent way 21c are drawn between the feeding pump 15 and the treating solution introduction valve 8. The latter treating solution recovery passage 22a is opened for free passage by the treating solution storage container 6 via the treating solution recovering valve 44, and the treating solution effluent way 21c is connected to the drain 43b for treating solution recovery via the 3rd effluent valve 47c.
[0066]the case where the treating solutions Q are collected in the treating solution storage container 6 -- above -- substrate treatment tub 1 -> treating solution supply route 7 -> feeding-and-discarding liquid -- the [change-over valve 13 -> treating solution recovery passage 22 -> feeding pump 15 -> filter 10 ->] -- pass the treating solution recovery passage 22a (treating solution recovering valve 44) of two -- the treating solutions Q are collected in the treating solution storage container 6. In discarding the treating solution Q which carried out exhaustion, while closing the treating solution recovering valve 44 of the above-mentioned treating solution recovery passage 22a, the 3rd effluent valve 47c is opened, and it discharges the treating solution Q to the drain 43c for treating solution recovery with the feeding pump 15. Thereby, separation discharge of the treating solution Q is carried out in the treating solution storage container 6 and the drain 43c for treating solution recovery (henceforth the separation excretory function of a treating solution).
[0067]Into the above-mentioned substrate treatment tub 1 and the treating solution storage container 6, immersion arrangement of the homoiothermal heater 5 is carried out, and a treating solution can be conjointly adjusted to a uniform temperature with circulation filtering mentioned above (henceforth the homoiothermal maintenance function of a treating solution). Thereby, especially in an elevated-temperature chemical treatment, it becomes possible to supply the treating solution Q of prescribed temperature in the substrate treatment tub 1, and to carry out washing processing promptly, and a throughput improves. While immersion arrangement of the bubbling means 24 is carried out into the above-mentioned substrate treatment tub 1, supplying N_2 gas from the gas supplying path 23 on the occasion of washing processing of a substrate and forming the uniform upflow of the uniform treating solution Q, It is constituted so that washing processing may be promoted (henceforth the bubbling function of a treating solution). The unit valve 37 and the gas filter 38 for gas introduction are attached to this gas supplying path 23.
[0068]It is constituted by the above-mentioned treating solution storage container 6 so that drug solution q_1, q_2, and q_3 may be poured in via two or more chemical introducing valves 48a, 48b, and 48c, respectively.
These drug solution q_1, q_2, and q_3 can be prepared, and a necessary treating solution can be made (henceforth the preparation function of a treating solution).

Various kinds of detectors 18 which detect the surface level and residue of the treating solution Q, temperature, etc. are formed in the above-mentioned substrate treatment tub 1 and the treating solution storage container 6.

[0069]Drawing 11, drawing 12, and drawing 13 show the outline distribution diagram of the dipping processor applied to Embodiment 10 of this invention, respectively, the thick line in drawing 11 shows the treating solution circulating route in the case of a chemical treatment, and the thick line in drawing 12 and drawing 13 shows the pure water path and treating solution circulating route of a case of pure water processing, respectively. This dipping processor provides several treating solution storage container 6_A and 6_B from which a treating solution differs to the single substrate treatment tub 1, The point which constituted treating solution supply route 7_A, 7_B, and the treating solution recovery passages 22a and 22b to each treating solution storage container 6_A and 6_B so that a change was possible differs from the above-mentioned Embodiment 9 fundamentally.

[0070]According to this Embodiment 10, a part of treating solution supply route 7 (between the opening and closing valve 9a and the treating solution introduction valves 8) serves also as the treating solution recovery passage 22 under treating solution recovery like Embodiment 9. The opening and closing valves 9a and 9b which connect two or more treating solution storage container 6_A and 6_B to the above-mentioned treating solution supply route 7 so that a change is possible are also the treating solution selective valves 82. The treating solution recovering valves 44a and 44b which connect two or more treating solution storage container 6_A and 6_B to a part of treating solution supply route 7 (between the opening and closing valve 9a and the treating solution introduction valves 8) which serves as the treating solution recovery passage 22 so that a change is possible are also treating solution ******** 83.

[0071]The quick drain valves 32 and 33 for rapid wastewater are attached to the above-mentioned substrate treatment tub 1 and the overflow collection part 41, respectively, and it is constituted so that an effluent can be carried out promptly, when emptying the substrate treatment tub 1 and the overflow collection part 41. The primary room and the above-mentioned overflow collection part 41 of the filter 10 are opened for free passage by the communicating path 85 via the check valve 86, and when blinding of the filter 10 arises, it is constituted so that a treating solution can be fed in the overflow collection part 41.

[0072]In drawing 11, when the chemical treatment by treating solution Q_A is performed, the 1st opening and closing valve 9a of the treating solution supply route 7 upstream, the treating solution introduction valve 8, the opening and closing valve 14 of the downstream, and the 1st effluent valve 47a that can be switched are opened, and other valves are closed. Treating solution Q_A is pumped up from the feeding pump 15 until it is filled in the substrate treatment tub 1 and it fully overflows it, the opening and closing valve 9a is closed after that, and the 1st effluent valve 47a is opened. treating solution Q_A overflowed from the substrate treatment tub 1 -- overflow collection part 41-> -- pass the pump upstream -> feeding pump 15 -> filter 10 -> treating solution introduction valve 8 -> opening and closing valve 14 of the effluent way 42 -> 1st effluent valve 47a-> treating solution recovery passage 22 -> treating solution supply route 7 -- it flows back substrate treatment tub 1. That is, the chemical treatment of a wafer is performed, performing circulation filtering of a treating solution.

[0073]After a chemical treatment is completed, the opening and closing valves 9a and 9b and the treating solution introduction valve 8 of the treating solution supply route 7 upstream are closed, and the feeding-and-discarding liquid change-over valve 13 which opens the 1st effluent valve 47a, and the treating solution supply route 7 and the treating solution recovery passage 22 of the effluent way 42 for free passage is opened. Another treating solution recovery passage 22a drawn between the feeding pump 15 and the treating solution introduction valve 8 is opened for free passage by the treating solution storage container 6 via the treating solution recovering valve 44. Other valves are closed and the treating solutions Q in the substrate treatment tub 1 are collected in the treating solution storage container 6.

[0074]When finishing recovery of a treating solution and shifting to pure water processing, as shown in drawing 12, the opening and closing valve 9a is opened, the feeding-and-discarding liquid change-over valve 13 is closed, and the 1st effluent valve 47a of the effluent way 42 is switched to the drain 43a side for wastewater. Treating solution Q_A collected in treating solution storage container 6_A is pumped up with the feeding pump 15, and circulation filtering is performed via the filter 10 and the 2nd treating solution recovery passage 22a. Subsequently, the feeding-and-discarding liquid change-over valve 13 is closed, the 1st effluent valve 47a of the effluent way 42 is switched to the drain 43a side for wastewater, the pure water introduction valve 27 of the purified water supply route 3a is opened, and it rinses the substrate W, pure water D_W being filled in the substrate treatment tub 1, and overflowing it. pure water D_W overflowed from the substrate treatment tub 1 -- the [overflow collection part 41 -> effluent way 42 ->] -- pass the effluent valve 47a-> 2nd effluent valve 47b of one -- it is discharged by the drain 43a for wastewater. And circulation filtering of treating solution Q_A is performed also between pure water processings of a substrate.

[0075]In drawing 13, when the chemical treatment by treating solution Q_B is performed, The latter part which is open for free passage to the above-mentioned substrate treatment tub 1 treating-solution supply-route 7b Receives, and treating solution storage container 6_B is connected via another opening and closing valve 19b (treating solution selective valve 82), The treating solution recovery passage 22b is connected via another treating solution recovering valve 44b (treating solution selective valve 83) to this treating solution storage container 6_B. That is, when circulation filtering of a treating solution is performed and pure water processing of a wafer is performed the same with being shown in drawing 11 when the chemical treatment of a wafer is performed, circulation filtering of treating solution Q_B is performed in drawing 13. Also in this Embodiment 10, it is constituted so that an ultrasonic-cleaning function, a pure water shower function, the separation excretory function of pure water, the separation excretory function of a treating solution, and a treating solution constant temperature function may be exhibited like Embodiment 9 (drawing 9).

[0076]Drawing 14 and drawing 15 show the outline distribution diagram of the dipping processor applied to Embodiment 11 of this invention, respectively, the thick line in drawing 14 shows the treating solution circulating route in the case of a chemical treatment, and the thick line in drawing 15 shows the pure water path and treating solution circulating route of a case of pure water processing. This dipping processor provides several treating solution storage container 6_A and 6_B from which a treating solution differs to two or more substrate treatment tub 1_A and 1_B, The point which constituted treating solution supply route 7_A, 7_B, and the treating solution recovery passages 22a and 22b to each substrate treatment tub 1_A and 1_B, and treating solution storage container 6_A and 6_B so that a change was possible differs from the above-mentioned Embodiment 10, Other points are constituted like Embodiment 10. The explanation which attaches the same numerals and overlaps is omitted about a member as stated above.

[0077]In this dipping processor, as shown in drawing 14, in each substrate treatment tub 1, the chemical treatment and pure water processing by treating solution Q_A and treating solution Q_B are performed in parallel selectively suitably, respectively. The chemical treatment and pure water processing in that case are performed according to Embodiment 10. Namely, when a chemical treatment is performed, as shown in drawing 14, each treating solution Q_A and Q_B are filled in each substrate treatment tub 1, overflowing treating solution Q_A and Q_B -- overflow collection part 41-> -- pass the pump upstream -> feeding pump 15 -> filter 10 -> treating solution introduction valve 8 -> opening and closing valve 14 of the effluent way 42 -> 1st effluent valve 47a-> treating solution recovery passage 22 -> treating solution supply route 7 -- it flows back substrate treatment tub 1. That is, the chemical treatment of a wafer is performed, performing circulation filtering of a treating solution.

[0078]When finishing recovery of a treating solution and shifting to pure water processing, as shown in drawing 15, treating solution Q_A and Q_B in each substrate treatment tub 1 are collected in treating solution storage container 6_A and 6_B, respectively. Treating solution Q_A and Q_B collected in treating solution storage container 6_A and 6_B are pumped up with the feeding pump 15, respectively, and circulation filtering is performed via the treating solution recovery passage 22a of the filter 10 and the latter part. It rinses a wafer, pure water D_W being filled in each substrate treatment tub 1, and overflowing it. pure water D_W overflowed from each substrate treatment tub 1 -- respectively -- the [overflow collection part 41 -> effluent way 42 ->] -- it is discharged by the drain 43a for wastewater via the effluent valve 47a-> 2nd effluent valve 47b of one. And circulation filtering of treating solution Q_A and 6_B is performed also between pure water processings of a wafer.

[0079]Although illustrated in the above-mentioned Embodiment 11 about what connects selectively two substrate treatment tubs and two treating solution storage containers, those substrate treatment tubs and a treating solution storage container can also be increased further. In that case, since two or more chemical treatments were performed in parallel by each substrate treatment tub, moreover the throughput improved further, explained as that to which the chemical treatment and pure water processing by treating solution Q_A and treating solution Q_B are suitably performed in parallel selectively in each substrate treatment tub, but. It may be made to perform a chemical treatment for exclusive use for every substrate treatment tub, respectively.

[0080]

[Effect of the Invention]Since it comprises an invention of claim 1 and claim 2 as mentioned above and acts, the treating solution overflowed from the substrate treatment tub, It is collected by the treating solution storage container via a treating solution recovering valve and a treating solution recovery passage, and since it can circulate and reuse to a substrate treatment tub again, the amount of consumption of a treating solution can reduce substantially. Since a chemical treatment and pure water processing can be performed by a single substrate treatment tub, enlargement of a substrate processing device can be prevented. Since a treating solution is transposed to pure water by making pure water supply and overflow on the occasion of the shift to the pure water processing from a chemical treatment after the treating solution has entered in a substrate treatment tub, the substrate can shift to pure water processing from a chemical treatment, without touching air. Thereby, an oxide film can be prevented from being formed in a substrate face.

[0081]In the invention of claim 3, since it is constituted as mentioned above and acts, while a chemical treatment and pure water processing are performed, a treating solution is effectively refreshed by filtering.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The outline distribution diagram of the dipping processor concerning Embodiment 1 is shown.
[Drawing 2]The outline distribution diagram of the dipping processor concerning Embodiment 2 is shown.
[Drawing 3]The outline distribution diagram of the dipping processor concerning Embodiment 3 is shown.
[Drawing 4]Drawing 4 (A) is an outline distribution diagram of the dipping processor in which Embodiment 4 is shown, and is important section drawing of longitudinal section of a liquid path in which drawing 4 (B) shows the B section of drawing 4 (A), and drawing 4 (C) shows the C section of drawing 4 (A), respectively.
[Drawing 5]The outline distribution diagram of the dipping processor concerning Embodiment 5 is shown.
[Drawing 6]The outline distribution diagram of the dipping processor concerning Embodiment 6 is shown.
[Drawing 7]The outline distribution diagram of the dipping processor concerning Embodiment 7 is shown.
[Drawing 8]The outline distribution diagram of the dipping processor concerning Embodiment 8 is shown.
[Drawing 9]The outline distribution diagram of the dipping processor concerning Embodiment 9 is shown.
[Drawing 10]The outline distribution diagram of the dipping processor concerning Embodiment 9 is shown.
[Drawing 11]The outline distribution diagram of the dipping processor concerning Embodiment 10 is shown.
[Drawing 12]The outline distribution diagram of the dipping processor concerning Embodiment 10 is shown.
[Drawing 13]The outline distribution diagram of the dipping processor concerning Embodiment 10 is shown.
[Drawing 14]The outline distribution diagram of the dipping processor concerning Embodiment 11 is shown.
[Drawing 15]The outline distribution diagram of the dipping processor concerning Embodiment 11 is shown.
[Drawing 16]It is an outline perspective view of the substrate processing device which applied the dipping processor of this invention.
[Drawing 17]It is an outline top view of the substrate processing device.
[Drawing 18]It is outline drawing of longitudinal section of the substrate processing device.
[Drawing 19]It is an outline top view of the substrate processing device belonging to conventional technology.
[Drawing 20]The dipping processor concerning the conventional example 1 is shown, the figure (A) is an outline distribution diagram of a chemical treatment, and the figure (B) is an outline

distribution diagram of pure water processing.
[Drawing 21]It is an approximate account figure of the dipping processor in which the conventional example 2 is shown.
[Description of Notations]
1 [-- Treating solution supply route,] -- A substrate treatment tub, 3 -- A purified water supply route, 6 -- A treating solution storage container, 7 8 [-- A pure water introduction valve, 42 / -- An effluent way, 43 / -- An effluent drain, 44 / -- A treating solution recovering valve, 47 / -- An effluent valve, D_W / -- Pure water, QA-QE / -- A treating solution, W / -- Substrate.] -- A treating solution introduction valve, 15 -- A feeding pump, 22 -- A treating solution recovery passage, 27

[Translation done.]